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PSYCHOLOGY

NORMAL AND MORBID

PSYCHOLOGY

NORMAL AND MORBID

BY

CHARLES ARTHUR MERCIER

LONDON

SONNENSCHEIN

1901

Dedication

TO

SIR JAMES CRICHTON BROWNE, LL.D., M.D., F.R.S.

TO WHOSE
PERSISTENT STIMULATION OF SCIENTIFIC WORK
ENGLISH ALIENISM OWES, MORE THAN TO ANY OTHER INFLUENCE,
ITS PRESENT SCIENTIFIC SPIRIT;
AND WHOSE SYMPATHY AND ENCOURAGEMENT
HAVE BEEN OF INESTIMABLE VALUE TO THE AUTHOR,
THIS BOOK IS DEDICATED
IN GRATEFUL ACKNOWLEDGEMENT.

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PREFACE

IT has long been a favourite tenet of mine, and there are now, I think, others who hold it, that Insanity is no exception to the rule which requires a knowledge of the normal as an indispensable preliminary to a knowledge of the abnormal. The reason why the contrary opinion has been maintained with such vigour, and the contrary practice so generally followed, has seemed to me to be the absence of any work in which normal psychological processes are dealt with from the point of view and for the purposes of the alienist. Of the many excellent works on Psychology which are at the service of the student, there is none that affords him material help in understanding the nature of those disorders of mind which it is the work of his life to study. For instance, the chief labours of the student of the disordered mind are concerned with the existence and nature of Delusion; but, as far as I know, no work on normal psychology gives him any help in settling the preliminary questions of what a delusion is; of how it differs from a normal state of mind; of its mode of origin; or of its varieties. It is true that these are not questions in normal psychology, and it is no reproach to the psychologist who deals with the normal alone that they are excluded from his purview; but it is a great disadvantage to the alienist to be left without guidance in the face of problems of such profound importance to him.

When I say that I am acutely aware of the shortcomings of the book, I am not guilty of that sin which is said to be in greatest

favour with a certain Personage. "No one," says Mr. Venn, "until he has actually made the attempt, can conceive the prodigious difficulty of thinking and writing with perfect consistency upon a subject which has been already treated by men his superiors in ability and knowledge, but which they have discussed from a very different point of view." This difficulty was not my least; nor was it my greatest. Arriving at my results, not by the eagle-swoop of genius, but by the slow and laborious process of gradual successive approximations, it has occurred continually throughout the progress of the book, that doctrines that appeared correct and adequate when applied to a portion only of the subject, have been found incorrect or inadequate when it was sought to bring under them an additional class of facts. For this reason it happened that, as later parts of the subject were dealt with, the earlier parts had to be re-written again and again; and now, as the proofs come under review, it appears that the harmonisation is not complete, and that there are inconsistencies and repetitions that might have been avoided by a still more often repeated revision. In excuse, I can but say that the book has been so long in preparation, and its attainment of that perfect consistency of which Mr. Venn speaks seems still so hopelessly distant, that it seemed better to publish it as it is, with all its faults, than to extend a delay which threatened to be indefinite in duration. Much allowance may fairly be claimed for the first essay in an untilled field. The disorders of mind have never before been systematically examined, arranged, and correlated with the normal types from which they erringly depart, and if the result displays a certain crudity, it may be alleged in excuse that the axe of the pioneer cannot leave such a finished result as the plane and the sandpaper of the subsequent investigator.

In examining once more, from a new point of view, those great and fundamental problems which have engaged the attention of so many of the profoundest thinkers for so many generations, I may incur the accusation of presumption of which I have often seemed

to myself to be guilty; but in this I take comfort from the thought that in attacking opinions which seemed to be unsound, I should have been false to their own ideal had I allowed myself to be deterred by reverence for the great thinkers who have explored these fields before me. When I have applied the forceps of argument to some carious belief, I have endeavoured to handle it tenderly, as if I loved it. I have myself suffered too much in the penitential chair not to sympathise with him who is in the agony of the extraction of some deep-fanged bicuspid belief, which he has fondly taken for a *dens sapientiæ*.

The whole theory of Reasoning has long seemed to me to be very unsatisfactory. The Syllogism, which for so many centuries maintained its undisputed sway as the sole form of reasoning, has of late years lost all its prestige, and has even been denied to be a form of reasoning at all. That it is not the sole form of reasoning I have long been convinced, and I have endeavoured to prove this to demonstration, not only by adducing instances of reasoning that cannot be expressed syllogistically, a task that has been accomplished by the most rigid upholders of Formal Logic, but by setting forth in detail all the modes of thinking by which conclusions are in actual practice attained. When this general scheme of reasoning processes is worked out, the syllogism falls into its proper place as a subordinate mode of axiomatic reasoning, which is itself one of six principal varieties of the thinking process. The subject-matter of Logic has always been excluded from Psychology, and regarded as a distinct science. Whether it ought to be so excluded depends entirely upon what is meant by Logic. If by Logic is meant the changes that can be rung upon the syllogism, and the applications that can be made of it—in short, what is usually termed Formal Logic, then I think it is as properly excluded from Psychology as is Mathematics, which consists, similarly, of the changes that can be rung upon axiomatic and proportional reasoning, and of the applications that can

be made of them. But if by Logic is to be understood the science of Reasoning processes generally, then it seems that to exclude it from Psychology, the science of mental processes, is to exclude the Prince of Denmark from the play of *Hamlet.* Holding this view, I have devoted a considerable portion of the book to what are usually called Forms of Thought, but which I prefer to call Modes of Thinking.

So far I have bowed the knee in the House of Rimmon, and conformed to ancient usage, as to discuss the subject of Fallacies in connection with the Syllogism. But if the Syllogism is not the sole mode of reasoning, then breaches of syllogistic rules are not the sole fallacies; and obversely, if there are fallacies that are not breaches of syllogistic rules, then they must be breaches of the rules of some other mode of reasoning. This seemingly obvious logical inference from the existence of fallacies *in materia*, was never reached, however, by the professors of Formal Logic in the course of the twenty centuries or so during which it has been studied. If by a fallacy is meant the erroneous performance of a reasoning process, then any of the six processes that are here distinguished is open to fallacy; and, among the fallacies to which they are subject, may be found the material fallacies of the Schools, to which no place could be assigned among the fallacies *in dictione.* Logicians have dealt with fallacies at great length, and have discussed with minute discrimination the exact nature of the error that has been committed when a wrong conclusion has been arrived at; but no logician, as far as I know, has ever shown how it comes about that an error is committed—what is the bait and what is the temptation which induces a reasoner to stray from the path, and to arrive at a wrong conclusion rather than a right one. This I have endeavoured to show.

The necessity of discussing fully the subject of Delusion involved a preliminary study of Belief, under which heading is included every degree of cohesion of a mental relation, from the merest

trace of Likelihood to the most settled and inescapable Conviction. In this connection the Doctrine of Chances is examined, and is shown to apply to but a very restricted class of phenomena, and I reject altogether the contention of mathematicians, that the fraction which expresses the Probability of an event is applicable to the degree of Belief or Expectation that we entertain with regard to the event. Probability is distinguished from Likelihood and from Expectation, and the discriminations are claimed to be useful.

The discussion of the various degrees of Belief led inevitably to the problem of epistemology, which I had hoped to leave on one side; but it came in the way, and had to be dealt with. The view taken seems to reconcile conflicting doctrines on the subject. In connection with Credibility, with which delusion is directly concerned, it became necessary to deal with Authority and with Faith in their most general aspects.

Modern psychologists will view unfavourably, I fear, the very brief consideration that is given to Apperception; but, while I regard as important the recognition of the organisation and schematisation of thought which the title now implies, I do not think that this recognition involves such a revolution in Psychology as the thorough-going Apperceptionist is inclined to claim for it.

In dealing with Volition, much use has been made of a doctrine of nervous mechanisms, which regards them as structural conformations underlying both Instinctive and acquired Determinations; and a suggestion, that mechanisms may become quasi-parasitic upon the Self, seems to be both fruitful and justified by our knowledge of the facts.

The problem of Freewill, like that of epistemology, was not included in the original programme, but it was found impossible to avoid it. Such a view is taken that Determinism is deprived of its old antagonism to Moral Responsibility, and need no longer be contested by theologians and moralists upon that ground. If this view is accepted, there

is some reason for hope that a modified Determinism may prevail, and that the long controversy between it and Freedom of Will may be brought to a conclusion.

In the section on Memory, endeavour has been made to clear up the ambiguities which have made the term one of nebulous meaning. The clear distinction here drawn between the four varieties of Memory, and between them and the process of Remembrance, will, I hope, be useful. This section is an expansion of a discourse upon the subject delivered at the Royal Institution in May, 1901.

The difficulty experienced by every psychologist who has treated of the subject, in finding a common term to cover both Pleasure and Pain, has been eluded by the adoption for this purpose of the term Affection, whose only recommendation is that it is not new in this sense. The function of Pain, its inevitability, and its extension and evolution conjointly with Pleasure, are first discussed; and then the biological significance of Pleasure and Pain is examined; their correspondence with benefit and harm respectively being shown to apply, not merely to the welfare and detriment of the individual, but to those of the race and the community also; and by this extension of the correspondence, anomalies hitherto inexplicable are explained. Affection is then dealt with in detail, as it accompanies Sensation, Thought, Volition, and Memory. In connection with the relation between Affection and Thought is advanced a new Theory of Emotion; in connection with the relation of Affection to Will the classical theory is examined, and an amended form is adopted.

The importance of Subject-consciousness has demanded treatment of it at considerable length, and the various meanings of the term Self have been disentangled. Disorder of the Subject-consciousness is dealt with, and the disorders of the personality to some extent elucidated.

It was found impracticable to arrange the subject with logical precision, in successive Chapters, all nominally of equal value, and

I have adopted an arrangement in sections, the key of which will be found in the Contents Table. Here each section is shown in its true perspective and in its due relations with the rest of the subject.

I have to thank my friend Dr. Donkin for his kindness in reading a great deal of the MS., and for valuable verbal emendations.

In psychology the defects of our terminology are great, and I can scarcely hope that I have always succeeded in making my meaning clear to my readers, but I have borne in mind that obscurity is a poor substitute for profundity; and by the rule of never abandoning a subject until I have made it clear to myself, I trust I have been able to present it in such a form as to be clear to others also.

C. M.

FLOWER HOUSE,
CATFORD, 1901.

CONTENTS

	PAGE
INTRODUCTION	1
SENSATION	7
Faults of Sensation	13
THOUGHT	20
The Relation	35
The Establishment of the Relation: Thinking	40
Syncrisis. I. Abstraction	44
II. Generalisation	47
III. Classification	50
Faults of Thinking	56
Faults of Syncrisis	59
Axiomatic Reasoning: The Syllogism	75
Faults of Axiomatic Reasoning: Fallacies	101
Analogy	114
Faults of Analogy	119
Proportional Inference	120
Faults of Proportional Inference	123
Immediate Inference	123
Faults of Immediate Inference	130
Mediate Inference	134
The Relation Established: Belief—	
Certainty	152
Uniformity in Experience	159
Likelihood	166
Probability	170
Likelihood and Probability	188
Expectation	190
Truth	197
Credibility	210
Faults of Belief: Delusion	248

PAGE

Originality 238
Apperception 244

VOLITION 282
Effort 294
Will and Desire 298
Free-Will or Choice 312
Character 341
Faults of Volition 344
Faults of Attention 345
Faults of Effort 352
Faults of Instinctive Determination 355
Faults of Acquired Determination 361

MEMORY 375
Structural Memory 382
Dynamic Memory 391
Active Memory 392
Conscious Memory 394
Reminiscence . . . . . 4[illegible]
Faults of Memory 414

PLEASURE AND PAIN 423
Affection and Sensation 441
Affection and Thought 444
Affection and Attention 458
Affection and Will 491
Affection and Memory 471
Faults of Pleasure and Pain 474

SUBJECT-CONSCIOUSNESS 488
Sensations of the Subject-consciousness 495
Thoughts of the Subject-consciousness 498
Volitions of the Subject-consciousness 498
The Subjective Nature of Mental Processes . . 502
Disorders of the Subject-consciousness . . . 5[illegible]

INDEX 513

PSYCHOLOGY
NORMAL AND MORBID

INTRODUCTION

WHEN consciousness dawns, we find ourselves in the midst of a world of material objects, most of which either move or are capable of motion, and in this world, among these moving objects, we too move. Our early concept of the cosmos is of a self in the midst of that which is not self, and of a continual commerce between the two. The self is continually acting upon the not-self; the not-self is continually acting on the self. The self is recognised to have a spontaneous activity, which it can direct in this way or that, and which it can suppress. It is not asserted that any such propositions are formally asserted, even to oneself, in an early stage of mental development; but it is upon such tacit recognition that the conduct of mankind is universally based.

As intelligence develops, we arrive in time at a distinction between the conscious self and the body which appears to contain it. The latter we identify as in some sort a part of the material world which is outside of the very self, while the latter retracts, separates, and stands as a thing apart. We find that portions of the body can be separated and restored to the world of not-self without any mutilation of the conscious self. We find that substances from the outer world can be ingested and incorporated with the body without any corresponding addition to the conscious self. We see that after the death of others the body remains, while the conscious self appears to be absent. In sleep our conscious self vanishes or roams afar, and yet we cannot

doubt that the body, which we find in the same surroundings in which we left it, has been there during the whole time of "our" absence. Thus we are in several ways driven to the conclusion that the feeling, knowing, desiring, willing, active self, is something apart and different from the body with which it was first identified; and different not only from the body, but *a fortiori* from every form and kind of material thing. So that at length the division of the cosmos into self and not-self becomes transformed into a division between the universe of matter, moving and movable, and the universe of mind.

What the ultimate relation may be between these two universes, whether in the last resort they remain absolutely disparate, or whether they are different modes of the same substance, it is outside the province of this book to speculate; but whatever the relation may ultimately be, mind, in our experience, is indissolubly connected with the active function of a certain portion or grade of nerve tissue.

We know of no manifestation of consciousness except in association with living bodies, nor with any living bodies but those that possess a nervous system; and we find that what we recognise as manifestations of consciousness bear a direct relation in prominence, in elaborateness, and in other respects, to the mass, the complexity, and other qualities of the nervous system of the animal concerned. When the central mass of the nervous system is severely damaged, consciousness is abolished. When this portion of the body is less severely damaged, consciousness is interfered with and altered in various ways. When a portion of the body is detached from its nervous connection with the brain, that portion of the body is detached from its intimate connection with consciousness, and is known only as a portion of the external world is known. Every shred of evidence goes to show that consciousness is directly associated with the action of the nervous system, and is not so directly connected with the action of any other constituent of the living organism. Hence we must look to the functions of the nervous system for an indication of the divisions of consciousness.

What, then, are the functions of the nervous system, broadly considered? It is the integrating and co-ordinating agent of the body. It is by the operation of the nervous system that all the several parts of the body act harmoniously together as a single individual. The function of the nervous system may be best understood by comparing the individual organism with other organisms or quasi-organisms—with an army, a factory, a nation, a ship. The men composing an army are

collected into groups of various sizes under officers of various grades, exercising concurrent authority of various degrees. A small number of rank and file are under the command of a non-commissioned officer; a small number of non-commissioned officers, with their commands, are subordinate to a subaltern; the subalterns and other regimental officers, with their commands, together making up the whole regiment, are controlled by the colonel; and so larger and larger groups are collected together under the command of officers of higher and higher grade, possessing authority that extends not only to a greater number of persons, but that over these persons is more absolute, until, in the commander-in-chief, the whole power of the army is summed up and represented. He alone speaks in the name and with the authority of the whole army; he alone directs the movements of the whole army. In him all the channels of information converge; from him all commands to the army are directed. By him all negotiations with authorities outside the army are carried on. Similarly in the individual organism, small portions of the body are under the control of nerve centres or ganglia of low rank. Several such sections of the body, with their controlling ganglia, are under the domination of more elevated centres; these again are grouped together under the control of centres of yet more extended sway, and the whole body is finally summed up and represented in the supreme nerve regions, which not only adjust the relative activity of different parts of the body, but receive, from all the avenues of sense, intelligence of the external forces acting upon the body, and direct the movements of the body as a whole in response to this intelligence. It is these supreme regions of the nervous system whose activity is accompanied by consciousness. Observation of any of these organisms or quasi-organisms will show that its regulating or governing authority combines within itself two main functions. In the first place, whether it is the commander of an army, the board of directors of a company, the captain of a ship, or the government of a country, it has the supreme control of all the internal affairs of the body over which it presides. It regulates the internal processes in their due proportion to one another, preserves discipline, and harmonises the relations between the several parts. In the second place it represents the total body corporate in all negotiations and traffic between that body and agents external to it. The government of the country, the directors of the company, the captain of the ship, the commander of the army, each speaks in the name and

wields the entire forces of the body over which it presides. It is to the governing body or individual that all representations are made, that all correspondence is directed, and it is by it that all acts done by the body corporate are devised and initiated.

The function of the highest strata of the nervous system, which are the substrata of consciousness, are strictly analogous to those of the governing powers of such aggregates as have been instanced. These supreme regions of the regulating apparatus have a similar twofold function. They regulate the internal processes of the body in due proportion to one another; they preserve harmonious and co-operative relations between the actions of the several parts of the body; and in addition to this, they represent the whole body in all traffic between the body and agencies external to it. It is to the highest nerve regions that are conducted all impressions made upon the body from without. It is by the highest nerve regions that all acts done by the whole body are devised and initiated. It is by them that the whole forces of the body are wielded and directed. It is in them that the self is summarised. It is by them that the commerce between the self and the not-self is carried on. For practical purposes the highest nerve regions *are* the individual. The rest of the body is an apparatus to sustain them and to serve them.

Consciousness, which is the accompaniment of the action of the highest nerve regions, exhibits two main and fundamental departments corresponding to the main and fundamental divisions of the functions of the highest nerve regions. Those activities which regulate the internal bodily processes have for their accompaniment the consciousness of self, or, as it is sometimes termed, subject consciousness. Those activities which regulate the commerce between the self and the world outside of self have for their accompaniment the consciousness of this external world and of its relations to the self, or, as it is sometimes called, object consciousness.

The commerce between the individual and the world in which he lives consists manifestly of three prime factors: reception of motion, modification of motion, and emission of motion; and these three prime factors in the physical commerce between the body and the surrounding world correspond with three prime factors in the constitution of mind—Sensation, Thought, and Will. Sensation arises during, and corresponds generally with, the reception of motion by the individual. Thought arises during, and corresponds with, the combina-

tion and rearrangement of motion received. Will arises during, and corresponds with, emission of motion. Between the individual and the universe in which he exists occurs a continual interchange of motion—a continual action and reaction. Action of the universe upon the individual has its mental correlative in Sensation. Reaction of the individual upon the universe has its mental correlative in Will. And the intermediate stage, in which the received motion is decomposed, recombined, redistributed, and reflected, has its mental correlative in Thought. These are the three primary and fundamental faculties or constituents of conscious experience, and in the constitution of mind they are coimportant and coequal. Neither is afore or after other, none is greater or less than another.

When a body is subjected to the incidence of motion—when motion is added to or abstracted from it—its constituent parts are disturbed, and their arrangement with respect to one another is altered. When the disturbance ceases to act, when the addition or abstraction of motion ceases, the disturbed parts either return to their former disposition, in which case the body is perfectly elastic, or they return part of the way, but not the whole way, towards their original disposition, so that while the disposition is altered, it is more nearly the original disposition than it was at the time the disturbance took place. The human body, being a material body, is subject, just as is every other material body, to the disturbance of its parts upon the reception or distribution of motion. It belongs to the second of the groups above mentioned in being imperfectly elastic. That is to say, the disturbed parts return towards the disposition in which they were before the disturbance took place, but they do not completely resume this disposition. The reception or distribution of motion by the body leaves in the body a modification of its structure, and like every other aspect or phase of the commerce between the individual and his surroundings, this enduring alteration of structure has its corresponding mental accompaniment. It is the physical basis of Memory.

But the individual does not merely exist. He maintains his existence. And he maintains his existence in the face of adverse circumstances that are constantly tending to destroy him and his race. Of the motion that impinges upon him, some is integratory in its effects, and helps him in his struggle; some is disintegratory, and tends to his destruction. Of the acts by which he dissipates the motion that he has received, some tend to his preservation, some to his destruction.

Neither the reception of motion nor the dissipation of motion is ever without some effect for or against his success in the struggle for life, and according as the commerce between himself and his surroundings is integratory or disintegratory, is beneficial or the reverse, is helpful or harmful to him in his conflict, so the mental state that accompanies the interaction has its corresponding quality. An interaction that is favourable is accompanied by the mental quality of Pleasure; an interaction that is harmful is accompanied by the mental quality of Pain.

Nor is this all. Life is essentially and necessarily teleological. Every organism, as it comes into the world, brings its mission with it, and its mission is primarily to continue its species, and secondarily, as a means to this end, to conserve its own existence until its primary mission is accomplished. Other intermediate and proximate ends, subsidiary to the main and ultimate end, appear and are followed; but, to the great object of continuing the race, all life is subservient. In organisms that are conscious, this teleological aspect of the commerce between them and their environment has its correspondence and accompaniment in their consciousness. I do not say that the end is known, is represented, or is deliberately striven for and sought. In the vast majority of cases it is not. But still this aspect, like every other aspect of the intercourse between the self and the not-self, has its accompaniment in consciousness. The strife toward an end has for its conscious correlative the state of Desire; the experience of an obstacle in the way of attainment of an end has its conscious correlative in Aversion.

Thus, then, we triangulate the country that we have to explore in detail. Moved by the Desire to attain ends, and by Aversion to the obstacles which obviate attainment, man acts in the circumstances in which he finds himself. The interaction between self and circumstances is Experience. Such experience as is an advance towards his aim is Pleasurable; such experience as baffles or hinders his advance is Painful. Every experience leaves in his organisation a change of disposition which is Memory. The elements in every experience are reception, emission, and redistribution of motion, which have their conscious correlatives in Sensation, Will, and Thought.

SENSATION

Sensation is the state of consciousness that corresponds *directly* with the reception of motion by or with the action of an external agent upon the body. The sensation of light, for instance, corresponds with the action upon the retina of luminiferous vibrations; and corresponds directly, for—(1) It corresponds in time. So long as the vibrations impinge upon the retina, so long the sensation of light endures. When the impact ceases the sensation ceases. (2) It corresponds in extension. The larger the area of the retina acted on, the more extensive or voluminous is the sensation. (3) It corresponds in intension. The more powerful the impact of the motion, the more powerful or intense is the sensation. (4) It corresponds in quality. The impact of these vibrations gives rise to a sensation of light—always of light, and of nothing but light. The impact of waves of a particular length gives rise to a sensation of a particular colour—always of that colour, and of nothing but that colour. Sensation, then, is the state of consciousness which corresponds directly with the action of an agent upon the body, and as the action of the agent upon the body varies in occasion, duration, extension, intension, and quality, so does the sensation vary correspondingly.

The sensations are, therefore, as numerous, and only as numerous, as the forms of motion that can act directly upon the body and that the body has apparatus for discriminately receiving. The luminiferous waves may beat upon a blind man, but they evoke no answering sensation, for he has no apparatus for discriminating them from other forms of motion. There are many natural agencies—many forms of motion—that are incident upon all of us daily and momentarily, but that arouse no answering sensation for this reason. In the struggle for survival, in the process of evolution, the body has acquired apparatus for discriminating those modes of motion only, the discrimination of which gave it an advantage in the strife. There are many modes of motion, the discrimination of which has not been important to the survival of the individual; and for the discrimination of these modes of motion no apparatus has been acquired. Such are the rays below the red and above the violet. Such are the *X* rays and other forms of electricity. Such are aerial vibrations of greater and of less frequency than our ears can appreciate. There is no doubt that owls and other nocturnal animals have capacity to discriminate degrees of light too feeble to

affect our eyes; and it is probable that insects have means of discriminating forms of motion to which we have no answering sensations. Permeating the world around us, and acting upon our bodies, are very many forms of motion, out of which we have acquired the capacity to discriminate those only whose discrimination has been of importance to the welfare of our race. As for the remainder, doubtless they produce some effect upon our bodies, and doubtless this bodily change has some answering change in consciousness, but as the body has no means of discriminating them, so there is no discrimination in the mind. The vague and peculiar sensations that many people experience in the approach of a thunderstorm correspond, no doubt, to the action of electric changes upon our bodies. But for practical purposes sensations are as numerous, not as the several modes of motion that impinge upon us, but as the modes that can be separately and discriminately received; and are powerful, definite, and minutely subdivided according to the elaborate specialisation of the apparatus by which the modes of motion are received.

The sensations that we are able to appreciate and the actions upon us with which they correspond are as follows:—

Sensation.	*Corresponding action.*
Touch	Mechanical movement of inappreciable magnitude.
Pressure	„ „ „ appreciable „
Warmth	Thermal vibration in plus quantity.
Cold	„ „ „ minus quantity.
Odour	Chemical combinations on the surface.
Taste	„ „ within the surface.
Noise	Irregular aerial vibrations.
Sound	Regular aerial vibrations.
Light	Luminiferous vibrations.

Thus to each mode of motion that the bodily apparatus can separately discriminate, a separate sensation corresponds, and this is true, not only of the modes, or primary divisions, but of the modes of the modes, or secondary divisions. To the impact of luminiferous waves corresponds the sensation of light, not that of hearing or smell; and to a given wave-length of impact corresponds a sensation of green, not of blue or red.

It has been pointed out that the body is not fitted with organs for the separate reception of all modes of motion, and it is now to be noticed that the organs that it does possess are not fitted with apparatus

for the separate and discriminate reception of all *degrees* of any mode of motion. Consequently, not only are there modes of motion impinging upon the organism to which modes there are no answering sensations, but of any mode of motion, for the reception of which the body does possess discriminating apparatus, there are certain degrees of quantity and quality which the discriminating apparatus is not competent to receive discriminately, and to which, therefore, no answering separate sensation corresponds. The luminiferous waves beyond the red and the violet cannot be discriminated by the eye, and therefore there is no sensation answering to them. Between adjacent semitones there is an infinite number of intermediate grades, of which but a few are discriminated by the apparatus of the ear, and consequently only to these few is there a separate corresponding sensation.

Then, too, to evoke the activity of our receptive organs, it is necessary that there should impinge upon them a certain *amount* of motion or, as we say, a certain strength of stimulus; and since an amount of motion less than this, although it doubtless produces some effect upon the body, yet is insufficient to be discriminated by the receiving organs, it has no answering sensation. There are sounds too faint for us to hear; there is light too faint for us to see; there are smells, contacts, etc., too faint for us to appreciate.

So that a certain minimum amount of motion must be impressed upon the body in order to evoke any sensation at all, just as a certain minimum blow must be given to the key of a piano, a certain minimum pressure to the key of an organ, before the instrument will speak.

When a blow of a certain strength is struck upon a nail, the nail is driven a certain distance into the wood. A blow of only half the strength will drive it approximately only half as far; blows of twice and three times the strength will drive it approximately twice and three times as far. The depth to which the nail is driven is, roughly, proportionate to the strength of the blow delivered. It might be supposed that every impact of motion upon the surface of the body evokes an amount or degree of sensation proportional to the strength of the impact; but this is by no means the case. It has to be remembered that the discriminating organs have been developed in answer to the needs of the organism for means of preservation; and degrees of discrimination that were not needed for this purpose have not been acquired, while those that have been acquired are such as shall be most useful for this purpose. It is found that minimal increases and

decreases in the amounts of motion incident upon the body have no answering increases and decreases in the intensity of consciousness. To evoke an answering alteration in consciousness, the alteration in the amount of motion impinging must bear a certain proportion to that already in process of reception.

For instance, if we are reading in the twilight, the approach of a lighted candle makes a considerable increase in the sensation of light. The addition of a second candle evokes an appreciable increase in the intensity of the sensation. If we are reading by the brilliant light of the incandescent gas-mantle, the addition of a candle makes but little difference in the sensation; and if we are reading by bright sunlight, the additional light of a candle makes no addition to the sensation at all. It is evident that the greater the strength of the stimulus that is being applied, the greater must be the increase, in order that there may be any addition to the sensation. Or take another mode of motion and another sensation corresponding. In a quiet room in the country the buzzing of a fly makes an appreciable addition to the sensation evoked by the rustle of the trees. During the performance of a brass band the buzzing of the fly evokes no appreciable increase of sensation; and during a clap of thunder even the band is unheard. The same addition to the incident motion does not, therefore, evoke the same addition to the sensation. In order that an addition may be made to the sensation, the addition to the motion must bear a certain proportion to the motion already incident. Supposing that a certain amount of incident motion or stimulus, which we will call m, evokes a degree of sensation s; and suppose that, in order to obtain an appreciable increase of sensation, m has to be increased by m', so that the stimulus $m+m'$ evokes a sensation s'. Now suppose that a much stronger stimulus M evokes a much stronger sensation S, and that M is increased by m'; S will not be increased. There will be no increase of S until M is increased by an amount M', which bears the same relation to M that m' bears to m. In other words, if $\frac{1}{2}$ m must be added to m to obtain an increase of s, then $\frac{1}{2}$ M must be added to M to obtain an increase of S, or for s to increase in arithmetical progression m must increase in geometrical progression. The fraction, by which the stimulus must be increased in order to obtain an increase of sensation, varies much with different senses, and with the same sense under different circumstances. Thus, it is much smaller for touch on the finger-tip and the tip of the tongue than in the thigh or the back.

Moreover, the rule is only approximately true, and for very small and very great stimuli it fails.

Every impact of motion upon the body must not only have a certain strength, with which the intensity of the sensation corresponds, but must impinge upon a certain *area* of the body, with whose extent the volume or extensity of the sensation corresponds. With some senses, as sight and touch, warmth and cold, differences in extensity are very well marked and prominent; with others, as smell and hearing, they are much less so. But differences in the area of the body primarily affected by the impact of motion are always responded to by differences in the extensity of the sensation. Probably in the case of smell the area of surface on which the chemical action takes place is always nearly the same, and hence there is little room or occasion for differences of extensity in the sensation. In the case of hearing it is probable that the elements of the organ of Corti that are adapted to the discrimination and reception of long waves are larger than those adapted for short waves, and consequently grave sounds have a voluminousness that is lacking in acute sounds. Moreover, long waves are accompanied by sets of shorter waves (overtones), which, being discriminated by additional elements of the auditory apparatus, add to the area of the surface impressed. The difference between the sensation evoked by a spark on the skin and that aroused by a warm bath well illustrates the difference in extensity or voluminousness of sensation.

The last aspect of sensation is its duration, which corresponds with the length of time during which the corresponding motion is being received by the body. So long as the incidence of motion endures, so long the sensation endures. When, as in the case of taste, and especially of smell, the incidence of the motion is gradual in commencement and termination, the temporal limits of the sensation are similarly gradual. When, as in the case of sound and touch, the beginning and ending of the action are definite, the temporal limits of the sensation are similarly definite. When the matter is very minutely investigated, it is found that the duration of sensation is not precisely the same as that of the incidence of motion. The duration of the sensation evoked by a flash of lightning, brief as it is, is yet very much greater than that of the flash itself; but these differences are of no practical importance, and need not be considered here.

What is important, however, is to recognise that although we may analytically separate sensation from other modes of consciousness, yet

pure sensation is an impossibility. If by sensation we mean a state of consciousness, then it is doubtful whether a sensation can be present in consciousness without a direction of attention towards it; and it is certain that, except in the most rudimentary intelligence, a sensation cannot be present in consciousness without being perceived; without being known; without being classified as of this or that mode, and even as this or that mode of a mode; that is to say, there can be no sensation without an admixture of thought. It is doubtful also whether there can be sensation without some degree of pleasurable or painful quality attaching to it. Certain it is that we cannot be conscious of a colour without at the same time being conscious that the sensation is one of sight, and not of hearing; without classifying it among the colours, and not among the sounds. Nor can we have such a sensation without a consciousness of the submode of it; without knowing whether it is red, or blue, or green, or some other particular colour; and all these modes of consciousness are modes, not of Sensation, but of Thought.

It may as well be stated here once for all that no one of these modes of consciousness ever occurs isolated from the rest, with the possible exception that quality, pleasurable or painful, need not necessarily be present, or, more strictly, may be present in minimal and unnoticed degree. As motion cannot impinge upon the highest nerve regions without being there redistributed; nor without arousing the activity of those centres, or some of them, to the emission of motion; nor without leaving an enduring modification of its structure in its passage; nor without in some degree contributing to or detracting from the general welfare of the organism; so Sensation cannot arise in consciousness without the simultaneous occurrence of Thought, Attention, Memory, and Pleasure or Pain. And what is true of Sensation is true of each other mode of consciousness. It exists, not alone, but in combination with all the others, and is separable only by introspective analysis. But what makes this analysis in many cases easy, is that frequently a single mode assumes such disproportionate prominence as to overshadow the remainder, and to render the single mode, if not easily separable throughout, yet easily discriminable as different in the main from the rest.

This general view of Sensation is as much as is required for the purpose of the alienist. For detailed analysis of individual sensations the student is referred to the ordinary text-books of Psychology.

DEFECT, ERROR, AND DISORDER OF SENSATION

Every phase of consciousness corresponds, as we have seen, with some phase of the interchange of motion between the organism and its surroundings; with some feature of the interaction between the self and the not-self. To every mode of motion that impinges upon the organism and that has for the organism a biological significance—that is to say, to every mode of motion whose discrimination by the organism is important for the conservation of the organism—a mode of sensation corresponds.

The vividness or magnitude of a sensation corresponds, not with the amount of the incident motion, but with the degree of biological importance of the mode of motion. The absolute amount of motion that is incident upon the organism in a wave of aerial vibration, or in pressure on the surface of support, may be immensely greater than that which is incident in a luminiferous wave; it may be incident upon a far greater area of surface, and at each point of the surface involved may be indefinitely greater in amount; and yet the sensation of light may be of far greater magnitude or vividness than the sensation of sound or pressure.

And the reason is clear. The appreciation of the incidence of a minute amount of motion in the form of luminiferous waves may be of greater biological importance—that is to say, may be of greater service to the organism in its struggle to maintain itself—than the appreciation of the incidence of a much larger amount of motion in the form of aerial waves or of molar contact; and therefore, in the process of natural selection, the power of appreciating the one has been gained in excess of the power of appreciating the other. Therefore in the retina has been evolved a multiplying apparatus by which the inconceivably fine vibrations of the ether are converted into the comparatively coarse movements of the molecules of nerve tissue.

The general result of the process of natural selection has been that the modes of motion impinging upon the organism are appreciated with that degree of vividness which is most important to the organism, or which is of most service to the organism in its struggle for existence. Sensations have thus become adjusted or equilibrated to modes of motion, each degree of each mode of incident motion arousing a corresponding degree of a corresponding mode of sensation.

When sensation is disordered, this equilibration is disturbed. The

degree, or even the mode, of sensation no longer corresponds with the degree or mode of incident motion. It is evident that there are three possible ways in which the adjustment of sensation to incident motion may fail. (1) The sensation may fail to attain a magnitude corresponding to the amount of incident motion, or may even fail to arise at all. (2) The sensation may be in excess of its due magnitude with respect to the amount of incident motion, or may even arise in the absence of such incidence. (3) The mode of the sensation may be out of correspondence with the mode of the incident motion.

1. *Deficiency of Sensation.*—The failure of sensation to arise in due proportion, or to arise at all, upon the incidence of motion on the organism may be, and usually is, due to some defect either in the receiving apparatus or in the conducting paths by which the motion is normally led from the periphery of the body to those highest nerve regions, whose consequent activity is a necessary condition of sensation. Such obstructions to the reception and passage of motion fall entirely within the province of the physician and the surgeon, and are of no significance to the alienist. They include such lesions as opacity of the cornea, or other media of the eye, failure of the function of the retina, optic nerve, optic tract, or of any other conducting path below the highest nerve regions, and of corresponding defects in the other sense organs. Psychological defect of sensation occurs only when the highest nerve regions are reached by the incoming wave of motion, but fail to admit, or, at any rate, to respond to it. Whether, indeed, a defect more recondite than this may exist; whether that mode of activity of the highest nerve regions which is ordinarily accompanied by sensation may take place without being accompanied by sensation, we do not know; and as we have no means of knowing, it is fruitless to speculate; but the penultimate defect that has already been mentioned—the failure of the arriving motion to enter the highest nerve region whose confines it has yet attained, or perhaps the failure of entrant motion to arouse the degree or the kind of activity that is necessary for the occurrence of sensation—does undoubtedly occur, both in normal and in abnormal states.

Motion in quantity sufficient to arouse vivid sensations in the waking state may impinge upon the body during sleep without arousing any sensation at all. A man or, at any rate, a child may sleep through a thunderstorm without experiencing any sensation of sound. In this case the incident motion undoubtedly penetrates along the conducting

paths into the interior of the organism; but either does not reach the highest nerve regions, or reaching does not enter them, or entering does not produce that change in the existing motion which is the necessary physical counterpart of sensation. Which of these alternatives is the true one is not a matter of great concern; but the fact that the sensation is not always wholly absent, but is sometimes present, although in very defective degree, points to the fact that some, at any rate, of the motion, and it may be all, does penetrate to the highest nerve regions, and that the third of the alternatives is the true one. An illustration may render clearer the state of things that is supposed. A certain amount of heat may be added to a piece of ice, and may or may not melt it according to the temperature of the ice when the heat is first applied. If the ice is very cold, it may be warmed many degrees without reaching melting point; if, on the other hand, it is but a degree or two below freezing point, a comparatively small amount of added heat will be sufficient to melt it. During sleep the intrinsic motion of the highest nerve regions may be supposed to be very small, and the addition of a moderate amount of motion may not be sufficient to produce the degree of activity in them to which sensation corresponds. In waking moments, the intrinsic motion being great, a small increment is enough to set the necessary process going.

There are morbid states in which an analogous state of things obtains, in which the intrinsic motion of the highest nerve regions is at so low an ebb that entering motion arouses either a sensation which is deficient in intensity, like the sensations which sometimes mingle with our dreams, or no sensation at all. The first of these conditions appears to obtain in dementia. The dement requires stronger stimuli than the undemented person to evoke reaction, and it is probable that the sensations that stimuli arouse in him are feebler than those which the same stimuli would have aroused in him in his normal condition. Of course, it is possible that the defect may be in reaction alone, and that the sensations are experienced in all their normal vigour; but this is extremely unlikely, for, apart from other indications, the remembrance that recovered dements retain of the sensations experienced by them during the existence of their dementia is very feeble or altogether wanting. When we find that a dement will remain, without protest and without effort to escape, under conditions which, in a normal person, would be painful; when we find that he will lie naked in the cold without complaint and without effort to cover himself, in the wet

without moving out of it; when we find that he must be addressed repeatedly and loudly before his wandering gaze is fixed and a glimmer of intelligence appears in his vacant features; we can scarcely doubt that, in addition to the slow and deficient reaction to impression, there is also an actual deficiency in the sensations that are experienced.

Whatever doubt we may have as to the deficiency of sensation in dementia, we can have none as to its deficiency in stupor. In this condition reaction to impression is almost entirely absent. It is not entirely absent, for the patient still reacts to the solicitation of gravity by maintaining his equilibrium; but of sights, sounds, smells, tastes, and even contacts, he appears to have no appreciation at all. However loudly one may shout at him, he makes no response. If a finger is flipped within an inch of his eyes, he neither winks nor shrinks. Nay, he will even allow the flies to walk over not only his face, but his eyeballs, without manifesting by any sign that he feels the contact. Moreover, upon recovery, his mind is a blank as to all the impressions that he was subject to while in this condition. He has not the slightest remembrance of having experienced any sensation during the time that the state has persisted. We may therefore fairly accept the concurrence of evidence as showing that, in the state of profound stupor, motion upon the organism arouses no sensation at all.

The mere quiescence of, or absence of activity from, the whole of the nervous district, which is the last arcanum to which entering motion penetrates, is not the only condition under which this sensation answering to this entrant motion is defective. It may, it appears, be defective also when part only of this district is unrousable, and it appears that this unrousability of one part attends great activity of another.

In the normal it appears that when the highest nerve regions are very actively engaged in the emission of motion, this engagement is inimical to the reception of motion in quarters not closely concerned in the activity. During very great effort of any kind, sensations unconnected with the effort are not aroused, or are not aroused in their full strength. During any great concentration of attention in any particular direction sensations unconnected with this direction are similarly attenuated. When, for instance, attention is engaged in the adding up of columns of figures the dinner-bell may ring unheard. It may be said that the sound is not so much unheard as unattended to, and I shall not quarrel with the suggestion. Whether the attenuation of the sound is due to lack of reinforcement by the activity of

attention, or from lack of penetration of the impression into the important nerve region concerned, or to any other cause, is immaterial to the present issue; which is merely that during the concentration of attention in any direction, sensations unconnected with the subject of attention are not experienced with the same degree of vividness that they otherwise would be. At the end of a long day's march a man gets at length the opportunity of relieving his parching thirst, and not until the agony of his thirst is abated does he become fully aware of the pain of his blistered foot. While he is slaking his thirst his foot does not trouble him at all. The sensation of pain is absent. And when his thirst is relieved, he either first becomes aware that his foot is raw, or the sensation from the foot is intensified. In the intense excitement of battle, in the riveting of attention and the strenuous muscular exertion that then take place, not only are very many strong impressions of sight, hearing, and contact unfelt, but even severe wounds and mutilations may be experienced and yet no answering sensations be aroused.

An analogous state of things obtains in certain abnormal states. In that condition known as melancholia attonita, the whole attention appears to be absorbed in some frightful imagination, and, in this absorption of attention, ordinary stimuli fail to arouse sensation. Call them by name, and they make no response. Push them, pinch them, prick them—still no response. They appear to have no consciousness at all, to be in the mental condition of a person in deep sleep, or in the state of stupor; and yet when they recover they tell us that, during the time in which they appeared thus unconscious, they were, in fact, intensely conscious of a horribly painful emotion to which all their attention was directed. In acute mania also, in which the attention, while far from being absorbed or concentrated, while being, in fact, in the opposite condition of extremely rapid fluctuation, is yet in a state of very high activity, sensations which are out of the focus of this activity are not attended to, and are, it appears, wanting in vividness. When a man is raving and ramping, one may shout at him, pluck at him, shake him, and slap him in a manner which would arouse resentment in a normal person, but upon him it produces no such effect. It does not even arouse his attention; and although we cannot be certain of what passes in his consciousness, every indication that we have points to the supposition that the sensations which these impressions arouse in him are very much weaker than those that would be aroused by like stimuli in a normal person.

In the cases supposed, the highest nerve regions, or some part of them, are in a state of great and even of excessive activity; and the failure of the sensation to appear in its usual strength, upon the arrival of its appropriate stimulus, is directly connected with this exaggerated activity. We shall find hereafter, in dealing with Attention, that the integrated region of nerve tissue, which we term the highest, is incapable of issuing considerable currents of motion in more than one direction at one time; and it appears as if the normal and customary inability to attain to great activity in more than one direction became, when the issuing activity in that direction is very great, an inability to attain any activity at all in other directions. Or if we suppose that the issue of activity in one direction implies activity of a part only of these regions, then it would appear that great activity of one part is antagonistic to activity in other parts; and that very great activity of one part is inconsistent with any activity, or with any but a minimum activity in other parts.

The second disorder of sensation occurs when the degree of the sensation is in excess of that which normally arises upon the incidence of that amount of motion upon the organism, or which in a long course of generations has become determined as that which is most useful to the organism. In this case, again, we have to distinguish a true psychological excess, that is to say, a sensation which is excessive with respect to the amount of motion incident on the highest nerve regions, from one which is excessive with respect to the amount of motion incident on the surface of the organism. It is certain that in inflammations and other disorders of the receiving apparatus—in the sensory end-organs—these organs overact their part. If their function is, as in some cases it undoubtedly is, to reinforce and multiply the incident motion, and to transmit it upwards in enhanced amount, then, as in photophobia, they overdo this function, and transmit too much. The exaggerated motion, on arriving at its destination, arouses an exaggerated sensation, but the excess of sensation is evidently not a psychological excess; it is not due, that is to say, to any excessive response of the highest nerve regions to the motion which is incident upon them. The fault is on a lower nervous level, and concerns not the psychologist, but the physiologist.

There are states of the highest nerve regions in which arriving motion arouses an enhanced and unusual degree of sensation, but whether there are any in which the enhancement is so considerable

as to approach within measurable distance of that of photophobia, is very doubtful. There are cases of cutaneous hyperæsthesia in which the fault is certainly in nerve regions below the highest, and even as abject as the spinal cord; and even in cases in which the lesion is much higher than this, as in certain cases of hysteria, it is very doubtful whether it can rightly be localised in the highest. The pattern of its localisation would alone seem sufficient to negative such a supposition.

When, however, the highest nerve regions are generally in a state of high activity, which yet does not issue in bodily action, incident motion arouses sensations that are decidedly enhanced in degree. Such states of generally high, but undirected or little directed activity, occur during powerful emotion; and the influence of emotion, so long as it does not issue in action, in enhancing sensation is well known. In all emotional states unaccompanied by bodily activity ordinary impressions arouse sensations that are of unusual prominence. When we are experiencing great enthusiasm, great peril, great joy, sensations aroused by ordinary impressions are of more than ordinary vividness. The enhancement of the action of the highest nerve regions that occurs under these conditions involves enhancement, not only of sensation, but of attention, of thought and of memory as well, and will therefore have to be dealt with again under these headings. In any concrete experience all these effects are intermingled, but it is easy in analysing it to discern the enhancement of each mental state.

A general enhancement of activity of the regions concerned takes place also in active and distributed states of attention, and under these circumstances also the intensity of sensations is enhanced. It will be shown in a future section that attention cannot be active in more than one direction at the same time, but there is a state in which the activity of the highest nerve regions appears to be nascent throughout those regions, and in which, while attention is not strongly directed in any particular direction, there is yet an alertness of mind, a readiness of attention to be aroused and to be directed, and in this condition impressions readily arouse attention, and are therefore attended by enhanced sensations. Such a state of alertness exists, for instance, in walking in the dark; in the case of a scout exploring in hostile country; in the case of a person who is attending to several things in rapid alternation, or, as he would himself say, at once. For instance, a schoolmaster who is showing one boy the solution of a

knotty problem, while at the same time he is keeping his eye upon a whole class of other boys, finds that a trifling noise—the whistling of a passer-by, or the grinding of a distant street organ—will arouse a degree of sensation that is unbearably intense. Similarly, an organist who is attending not only to the score before him and to his own performance upon his instrument, but also, in rapid alternation, to the performances of the different sections of his choir, will be distracted by some extraneous noise—by a fit of coughing or the cry of a child among the congregation. In the general nascent activity of the highest nerve regions, the discordant impression arouses an unwonted degree of sensation.

THOUGHT

The second of the primitive divisions or faculties of mind consists of those states of consciousness that correspond neither with the reception of motion into nor with the emission of motion from the highest nerve regions, but with the rearrangement or redistribution of motion in them; that is to say, with the decomposition and combination that the motion undergoes. It is by this rearrangement of motion that the acts, operated by the motion emitted, are adapted to the circumstances which impress motion upon the organism. An approaching cart impresses, on the eye and ear, motion which is carried to the supreme nerve tract. From this tract are emitted currents of motion, so directed and combined, that the body is removed out of the way of the cart. Between the reception of motion by the supreme nerve tract and the emission of motion from it, is interposed a process by which the outgoing currents are combined and directed in such a way that the resulting act is adapted to the circumstances from which the motion arises. The individual impressed does not lie down in the road, nor stand still, nor mark time, nor walk up against the cart. He gets out of the way. The process of regulating conduct to circumstances is called Intelligence, and when it occurs in the highest nerve regions, it has, like other material processes in those regions, a conscious accompaniment, which, in this instance, is called Thought or Thinking.

That Intelligence is the outcome of the rearrangement or redistribution, that is to say, of the composition and resolution of motion, is pretty evident. In the great majority of adapted acts, the amount of motion is far greater than the amount received. When an approaching

cart comes into view, the amount of motion that impinges on the retina is so infinitesimally small that, if it could be accurately measured, it would require a prodigious number of decimal figures to express it in foot-pounds. In order to produce the movement of the body out of the way of the cart, much motion must be added to and combined with that received; and although all of this motion is not added in the nervous system, yet some of it is undoubtedly added there. What is true of this case is true of every case in which adapted movements follow impressions. When a cricketer strives to catch a ball, some of the motion which is reflected from the ball on to the retina is distributed in the nervous system so as to arouse movements of the legs, some of it is so distributed as to arouse movements of the head and eyes, some to arouse movements of the arms and hands. The incident motion is, in the nervous system, resolved, or redistributed, and, without such resolution or redistribution of incident motion, adaptation of conduct to circumstances is impossible.

Further consideration reveals the fact that while the redistribution of motion is necessary to the adaptation of conduct to circumstances, it is also the sole factor that is necessarily involved in this adaptation. Given the power of receiving and of emitting motion, then the power of adapting the mode of emission to the circumstances which impress the motion can be only the redistribution of motion; that is to say, its combination with other motion simultaneously arriving or already resident in the organism, and its resolution into several streams, or currents, or modes of motion.

When we seek the factors which condition this redistribution of motion, it is obvious that they can be found only in the physical constitution or molecular arrangement of the medium in which the motion takes place. When a ray of light passes through a crystal of Iceland spar, it is split into two rays, which follow divergent paths. This resolution of motion is conditioned by the physical constitution of the spar. In passing through other translucent media the ray remains undivided, or, if divided, its resolvents pursue paths different from those that they follow through the spar. When a ray of light impinges upon a metallic surface, it is partly reflected, partly absorbed, and partly diffracted; and the resolution which the ray thus undergoes is conditioned absolutely by the state of the surface of the metal; that is to say, by its physical constitution. So when a wave of motion passes through any portion of the nervous system, the direction which

the motion will take, its composition or its resolution, depends entirely upon the physical constitution of the portion of the nervous system through which it passes.

Now the physical constitution of the nervous system exhibits, with respect to the manner in which it affects traversing fasciculi of motion, a twofold structure. In parts the arrangement of the elements of the grey matter is so fixed, so definitely and completely organised, that motion incident upon these parts pursues a course as definite and as invariable as that of a ray of light through a crystal of Iceland spar. Once arrived within the confines of this organised territory, the path of the motion, its composition or resolution, is determined, fixed, invariable, and predictable, and suffers no interference from errant waves of motion. Just so the shape of the iron bar that issues from a rolling machine is seen to result inevitably from the conditions to which it has been subject.

In a different region of the nervous system—in that region which on several accounts is called the highest—the constitution of the tissue is widely different. Here the disposition of the routes in which entering waves of motion are directed is not so severely restricted. Instead of travelling in predetermined paths, which permit of no diversion or interference with its direction, a wave of motion is free to become diffused, and is subject to the influence of other diffused waves traversing the tissue in directions so various and in amounts so diverse that the course of any one may appear wholly capricious and undetermined. Just so the shape and movement of a wreath of smoke appear to be capricious and indeterminate, although they are actually conditioned by rigid laws.

In both parts of the nervous system the path and distribution of the motion is conditioned by the molecular structure; but in one part this structure is fixed, rigid, consolidated, and the path and distribution of the motion invariable, while in the other the molecular structure is plastic, it is embryonic, it is unformed, but in course of formation under the influence of incident motion; it is so little determinate and so much liable to modification that two successive waves of entering motion, similar in amount and similar in direction, may issue in very different directions and combinations, and so give rise to very different sets of movements, to very different forms of conduct.

Between these two forms, or rather stages, of organisation there lie stages of every intermediate degree, from those which are just beginning to be organised, and to admit of the easier passage of motion in some

directions than in others, to those whose organisation is almost complete, and admits of the modification of their action only to a slight extent and by powerful influences.

At the one end of the scale is the structure by which the heart's action is produced, structure so completely organised that, so long as its constitution remains intact, it admits of variation neither in the direction nor in the composition nor resolution of the motion which it distributes, the only variation possible being in the rate of action, which is manifestly dependent on the rate of arrival of motion. Approximating to this structure are those which actuate the movements of the pupils, of the blood vessels, and other hollow viscera; of breathing, of coughing, of blinking, and all those that are commonly included under the title of reflex acts. Less completely organised, and therefore more liable to modification by external influences, are the nervous structures which actuate the automatic movements, as of locomotion, of articulation, of ingrained handicrafts, and so forth. Less determinate still are the structures through which are actuated the habitual and less oft-repeated acts; while for wholly novel acts there is no ready-made mechanism provided. They are actuated by motion which issues from the highest nerve regions in combinations determined from moment to moment by the force and direction of the waves of motion which happen to be prevalent there at the time.

It appears, therefore, that while all acts are dependent on the molecular constitution of the nervous system from which the actuating motion issues, some acts are completely determinate, owing to the fixed and determinate structure of the actuating tissue; while others are more or less indeterminate owing to the more or less plastic and indeterminate structure on whose activity they depend. It will be convenient if we designate determinate structure by the term mechanism.

It will be seen that a very large number of adaptations of acts to circumstances—that is, of intelligent acts—depend more or less upon mechanism as thus defined. The sudden closure of the eye in adaptation to the approach of a foreign body, the movements of equilibration in adaptation to the force of gravity, are actuated by fully formed mechanisms. The movements of articulation, of acquired handicrafts, and a thousand other movements, are actuated by partly formed mechanisms. Each such mechanism is a potential adaptation of acts to circumstances. It is by the activity of the mechanism that the adaptation is made. Before the mechanism is formed, the adaptation

is extremely imperfect, as we see in the efforts of children learning to walk, to talk, to read, etc. But when the adaptation is not required, when there is no need for winking, for walking, for speaking, for writing, no adaptation is made; the mechanism remains inactive. Such mechanisms are, of course, structural memories, but it is obvious that they may be regarded also as structural intelligence. They are adaptations *in posse* of acts to circumstances, though they may not be adaptations *in esse*. When they become functionally active; when they are the seat of activity; when motion passes through them—then they are adaptations *in esse*: then they give rise to acts, and the act, which is operated by the motion that they emit, is adapted to the circumstances which impressed upon the organism the motion that they receive. The functional activity of such a mechanism may be regarded as active intelligence.

The nervous mechanisms which effect the movements of the viscera are for the most part fully formed, while of those that actuate conduct but few are so complete as not to admit of modification in conformity with variations in the circumstances to be dealt with. Where there is no variation in the circumstances, and where these circumstances have been sufficiently often repeated in the life of the race, the mechanism has become completed, and the action follows as unfailingly and as unvaryingly upon receipt of the impression as the discharge of the loaded gun follows upon the pulling of the trigger. With such inevitable unvaryingness the eyelids close on the rapid and near approach of an object. With such inevitable unvaryingness the arms are thrust out when the body is falling forwards. With such inevitable unvaryingness follows the jerk of withdrawal upon a sudden painful impression.

But the great bulk of the circumstances which impress motion upon the organism are variable within narrower or wider limits, and consequently the great bulk of the mechanisms which have grown up in dealing with these circumstances retain more or less of their original plasticity. In some respects fully organised, so that in those respects the activity that they produce is unvarying, in other respects they remain plastic, so that in these respects the activity resulting from their action is capable of modification to meet the varying impressions made by the circumstances.

Of such mechanisms the nervous system of each animal contains a number proportioned to the variety of circumstances to which it has habitually to adapt itself, and of these mechanisms some exist fully

formed at birth, while others are only partially organised at that time, and others again are wholly formed in the lifetime of the individual. The mechanism for walking is fully formed in the chick at birth, as are the mechanisms for crying and sucking in the human infant. But the mechanisms for walking, articulation, and handicrafts are, in the human organism, formed after birth, and never attain to the completeness of organisation of the congenital mechanisms.

The great majority of the structural mechanisms which actuate conduct are formed during the life of the individual, and in every individual there are, especially in early life, many mechanisms in course of formation. The question at once arises, How are these mechanisms formed? And obscure as the process is, and defective as is our knowledge, both of the structure and of the recondite processes of the nervous system, the question admits of an answer which, if not complete, may be taken as correct as far as it goes. Briefly, the mechanisms are structural memories, and their formation is subject to the same laws that determine the formation of other memories. When a ray of light passes through a crystal of Iceland spar it passes, as is supposed, between the molecules of the spar, and without disturbing them from their position. The motion is the motion of the ether, which occupies the interstices of the molecules, and not that of the molecules themselves. It is otherwise with the passage of motion through the nervous system. The motion is motion, not of the ether, but of the molecules themselves, and is communicated from molecule to molecule. When motion passes through the nervous system the molecules are disturbed. If stationary, they are moved into new positions; if, as is more probable, they are already in motion, their motion undergoes perturbation. Now (see Memory) when motion is incident upon an organic body so as to distort it beyond the limits of its elasticity, the distortion remains after the motion ceases. In the case of the embryonic or unmechanised nerve tissue it appears that the effect of this distortion is such as to facilitate the subsequent passage of motion in the same path. If a wave of motion has once pursued a certain course, then subsequent motion incident upon the same spot will tend to follow the same course. If a wave of motion has at any point in its course been deflected or split up, or combined with another wave, or meets and discharges a magazine of motion, then at that same point a subsequent wave will tend to undergo a similar modification. And every successive wave of motion that pursues that path and undergoes successive modi-

fications in its course will facilitate the passage of subsequent waves along the same path, will increase their tendency to receive similar modifications at the same points. At the same time, there will occur, or rather, as a part of the same change there must occur, an increasing immunity of the same wave of motion from disturbance by increments of motion that are extraneous to the mechanism in course of formation. It is evident that if the wave of motion tends more and more to pursue a given course and to undergo given modifications, it tends less and less to be disturbed from that course and to undergo modifications that are incompatible with the given modifications. So that by the repeated passage of motion along a given course, the structure of that part of the nervous system through which it passes becomes so modified that the course becomes more and more determinate, less and less subject to modification. But a structure such that motion in passing through it pursues a determinate course is a mechanism. So that nervous mechanisms are formed, we find, by the repeated passage of motion along a certain course. In other words, when an adjustment to circumstances has once been effected, its repetition is more easily effected than its original formation; and with every subsequent repetition facility is increased until a maximum is reached which indicates the formation of a mechanism for its accomplishment. The mechanism once completed, no further increase in the facility of the adjustment can occur. Thus we find that when an adjustment is frequently repeated, a certain degree of facility is rapidly attained, but that the facility does not increase indefinitely. The rate of increase soon slackens, and at length a standard is reached, beyond which no increase takes place. This series of events is familiar to everyone. Everyone attains to a certain facility of equilibration, although very few attain to that perfection which is evidenced in gracefulness of gait; and beyond that degree of facility peculiar to himself, no amount of practice in walking will take him. Everyone attains to a certain fluency and distinction of articulation, which is great in some and less in others; but for each one there is a standard, beyond which no amount of practice will carry him. So that the old saying, "Practice makes perfect," expresses, as do most current sayings, an approximation to the truth, but not the exact truth. Practice does of necessity bring improvement, and sufficient practice will ensure improvement up to the maximum capacity of the practiser, but it will not ensure perfection except in the exceptionally endowed.

Once an adjustment of conduct to circumstances has been made, the organisation of a nervous mechanism by which the repetition of that adjustment is facilitated is a simple affair. What still remains to be explained is the original formation of an entirely new adjustment to circumstances, a process to which the term Intelligence will be allowed less grudgingly than to the structural mechanisms to which we have hitherto applied it—the process whose mental accompaniment is the process of Thinking. When a new adjustment to circumstances is made, what is the process that takes place in the nervous system? Let us take a concrete instance. When a sheet of postage stamps is bought, the stamps cannot be used until they have been separated from each other. Hitherto they have always been separated either by cutting them with scissors or by folding them, and tearing, or cutting them with a knife, down the fold. But these methods are defective, since scissors or knives are not always at hand, and the tear is apt to run irregularly and to tear the stamps in two. At length a man hits upon the expedient of dividing the stamps by lines of perforations, in which lines a tear will be directed and limited, without the aid either of cutting instruments or of a preliminary folding of the sheet. How, we have to ask, is this new adjustment to circumstances arrived at? and what is the nervous process by which it is actuated? The circumstances—the sheet of stamps, and the continuity of each stamp with its neighbours, the letters each awaiting a single stamp—impress upon the organism motion, which pursues its customary paths and rouses whatever activities are potential in the structure that it passes through.

The course that the stream of motion will take and the activities that it will arouse will be the same as on previous occasions, unless something has occurred in the meantime to divert the stream into a new path or to render new activities accessible to it. In the great majority of persons and of occasions no diversion, no involvement of new activities will occur, and the course of conduct will be in accordance with precedent. But the continuance or repetition of an act is always subject (cf. Affection and Will, p. 466) to the efficiency of the act in deriving benefit from the circumstances. If the act is harmful (that is to say, painful), then the course of conduct will be changed. If it produces no benefit, there will be no impetus to its continuance. If it results in benefit to the actor, then it will be continued or repeated with a promptness and unvaryingness in proportion to the benefit derived. In the present case the benefit derived from the act is impaired.

Scissors and knives are not always at hand. The time occupied in the operation is excessive, the result is frequently imperfect, the stamps being torn; hence in this case the impetus to the repetition of the act is impaired, and the conditions are favourable for a modification of the act by which greater benefit may be gained. The question is, How may a modification arise, seeing that the circumstances do not alter, and that *ex hypothesi* similar circumstances evoke similar acts? Clearly, whatever modification is introduced into the method of dealing with the circumstances is initiated from within, and is due to some new combination of mechanisms or of incipient mechanisms, in the nervous system, under the same laws that we have already found to govern the response of action to circumstances. In other words, like elements among the circumstances will evoke acts like those that have been found effectual in dealing with such elements.

Among the circumstances presented by the sheet of stamps that offers itself for division is the circumstance that a partial division in any direction facilitates a complete division in that direction. This is the basis of the method of folding the paper before tearing it. Now this circumstance is like many other instances of things parting more readily at places at which they have been partially divided, and tends therefore to arouse activities similar to those aroused by these instances. It is like the circumstance that a piece of wood, or metal, or stone, or paper, or what not will part more readily at a place at which it has been partially divided, by notching or perforation, than at another place at which it is intact; and this likeness in the circumstances evokes a like activity. Wood, iron, stone, and other substances have often been divided, intentionally or unintentionally, at places at which they were notched or perforated, and the similarity in the circumstances evokes a similar mode of activity in the present case, in which a substance has to be divided at a given place and in a given direction. The organisation of a new method of dealing with circumstances depends, therefore, upon the arousal, by certain elements in the circumstances, of modes of activity that have been effectual in dealing with similar elements in other sets of circumstances.

The formation of new adjustments to circumstances is, therefore, the formation of a new modification of old adjustments. It is the adaptation to new circumstances of a familiar mode of adjustment. This modification or adaptation is made up of two elements. First, a peculiarity in the modes of activity hitherto adopted for severing wood,

iron, and other substances is separated from the actual operations on those substances; and second, this peculiar mode of activity is combined with those employed for separating the stamps. There is a separation of activities and there is a combination of activities, and both these processes in the nervous system are necessary for the production of a new adaptation to circumstances.

Further, it is to be noted that the activities that are separated from one another are unlike activities, while the activities that are combined together are alike. Thus, the notching of wood is unlike the bending of it, which completes the severance, and the activities of notching and perforating wood and iron are like each other, and like that with which they are combined, of perforating the paper. So that we are now in a position to amplify our formula in intension while we restrict it in extension, and to state that the formation of a new adjustment to circumstances is effected by the combination of like activities and the separation of unlike activities in the nervous system.

Now, if it be true that whatever processes take place in the highest nerve regions have their counterparts in consciousness, this process of combination and separation of fasciculi of motion, which is the nervous process underlying Intelligence, has also its counterpart in consciousness. It needs no demonstration to prove that the conscious counterpart of Intelligence is Thought, but it may not be immediately apparent that Thought consists of two processes corresponding very closely with the two processes in the nervous system that underlie Intelligence. We have seen that the two processes involved in every intelligent act are the combination of like activities, and the separation of unlike activities. We have now to note that the processes involved in every judgment are the assimilation of like mental states and the discrimination of unlike mental states.

For, if we take the instance already given, of the adaptation of rows of perforations to the better separation of stamps from one another, and consider, not the nervous processes which actuate the conduct involved, but the mental operations that accompany those processes, we shall find that the latter display a striking parallelism with the former. The mental process is somewhat as follows: In the first place the consumption of time, the need of an instrument, the frequent injury to the stamps, form obstacles in the way of attainment of the desired end, which gives rise to aversion from this mode of operation and search for a better mode. Under the impulse of this desire, comparison

is made between this mode of dividing a substance in a given place and other modes of dividing substances in a given place, until a mode is remembered or observed which is more effectual. A more effectual mode is that of preparing the substance for complete division by a previous partial division. This mode has been found effectual in the case of wood, iron, brass, stone, glass, and other substances, and when it is compared with the mode of dividing the stamps it is seen to be unlike. There is discernment of likeness between the desideratum of dividing the paper and the desideratum of dividing the other substances; there is discrimination between the modes adopted and between the results; and finally there is discerned a likeness in the sequence between the various cases in which easy division has followed partial division in so many cases, and the easy division of the stamps under the same circumstances. We say that the easy division which has followed partial division in the other cases suggests that similarly easy division will follow partial division in this case, and by suggestion is evidently meant in this case a discernment of likeness between the suggesting thing and the thing suggested, between the observed sequences and the imagined sequence. So that the mental process by which the rows of perforations are devised is a comparison between mental states, and the discernment of likeness between one pair and of difference between another pair. It is discerned that the inefficiency of the methods of division by scissors, etc., is unlike the efficiency of the method of dividing wood, metal, stone, etc., by previous partial division; and that the efficiency of this latter method is like the efficiency that may be expected when the same method is applied to the case of the stamps. What determines me to adopt the method of perforation rather than that of cutting or tearing down a fold is that I think that the lines of perforation will be a more efficient method of securing accurate division of the stamps under all circumstances. What is the process by which I think so? It is this: I discern that the inefficiency of the method of division by scissors, etc., *is unlike* the efficiency of the method of dividing wood, metal, stone, etc., by previous partial division, and that the efficiency of this latter method *is like* the efficiency which I may expect to secure by adapting this method to the case of the stamps.

Every case of thinking, or inferring, or judgment, is the establishment of a relation of likeness or a relation of unlikeness between mental states, and every thought, every inference, every judgment,

is the relation so established. That this is so is manifest from the form in which thought is expressed. The expression of thought is a proposition, and it was universally agreed by the older logicians that all propositions are reducible to the two general forms, "*A* is *B*" and "*A* is not *B*." But to say that *A* is *B* is to say that *A* is like *B*—is like to the point of generic resemblance, or of specific resemblance, or of duplication, or of actual identity, for all these meanings attach to the expression; and to say that *A* is not *B* is to say that *A* is unlike *B*. There is no possible ground for the assertion that *A* is *B* except that the likeness between *A* and *B* is more or less complete. There is no possible ground for the assertion that *A* is not *B* except that *A* is unlike *B*. If *A*, a material object, is like *B* in every respect—in all qualities or attributes, including position in space and in the simultaneity with which that position is occupied, then we must infer that *A* is identical with *B*, and there is no other ground for asserting this identity except the discernment of these concurrent likenesses; and if there is in any quality, including position in space and simultaneity of occupancy of that position, any unlikeness between *A* and *B*, then we must infer that *A* is not identical with *B*, and there is no ground for inferring this non-identity except the discrimination of an unlikeness. If *A* is not identical with *B*, then to say that *A* is *B* is manifestly to say that *A* is like *B* in some respects.

Thinking, inferring, or judging, is therefore the bringing together of two mental states, and the establishment by comparison of a relation of likeness or unlikeness between them; as, this colour is like that; this sound is unlike that; or, generally, *A* is like (or unlike) *B*; or, more generally, *A* bears a certain relation to *B*; or *A* : *B*. The thought that results from this process is a new state of consciousness compounded of the two states or terms and of the relation which they are found to bear to one another. It consists of the two states associated in the relation, as, the likeness between these colours, or the unlikeness between these sounds, or generally, the likeness (or unlikeness) between *A* and *B*, or more generally, the relation between *A* and *B*, or (*A* : *B*). As the process of establishing the relation is termed thinking, inferring, judging, or conceiving, and when expressed in words is called predicating, so the result is termed a thought, inference, judgment, or concept, and, when expressed in words, is called a predication or proposition. It is obvious that when, having been formed on some previous occasion, a thought is repeated, or comes again before

consciousness, it is a memory. It may then be called a memory, or may retain the name of a thought, inference, etc., according to the connection in which it appears.

The thought or concept, once formed, may then be dealt with in consciousness as a single mental state, and may enter into relations with other mental states, so taking part in the formation of new states, or thoughts, as, for instance, the likeness between these colours is like (or unlike) the likeness between those colours; the difference (or interval) between these sounds is unlike (or like) the difference (or interval) between those sounds; or, generally, the likeness (or unlikeness) between *A* and *B* is like (or unlike) the likeness (or unlikeness) between *C* and *D*; or, more generally, the relation between *A* and *B* is like (or unlike) the relation between *C* and *D*, or, still more generally, the relation between *A* and *B* bears a certain relation to that between *C* and *D*, or $(A : B) : (C : D)$ or $A : B :: C : D$. The relation thus established may again be dealt with as a single state, and may enter as a term into other relations, and so the process may continue, the results being thoughts of continually increasing complexity, and very many of our thoughts are in fact of a very high degree of complexity.

It will appear from what has been said that thoughts are divisible into two classes, according as they are relations between simple mental states or relations between relations, and this is approximately true, though the distinction is not of much importance. The difference between the relation of one musical tone to another, and the relation of the interval between two tones to the interval between two other tones, is not an important difference from any point of view; and the difference is not an absolute difference.

The simplest states of consciousness that occur in the human mind are far from being undecomposably simple, but consist of a complex of relations. The mental operation called by logicians "simple apprehension" partakes of the nature of all other forms of thinking in being the establishment of relations, not between simple states of consciousness, but between complex groups of related states. "Simple apprehension," says Whately, "is the notion or conception of any object in the mind analogous to the perception of the senses. It is either Incomplex or Complex. Incomplex Apprehension is of one object, or of several without any *relation* being perceived between them, as of 'a man,' 'a horse,' 'cards'; Complex is of several *with* such a relation, as

of 'a man on horseback,' 'a pack of cards.'" He seems here to be speaking of the result rather than of the process; but Jevons is more explicit. "Simple Apprehension," says he, "is the act of mind by which we merely become aware of something, or have a notion, idea, or impression of it brought into the mind. Thus the name or term Iron instantaneously makes the mind think of a strong and very useful metal, but does not tell us anything about it, or compare it with anything else." It would seem superfluous to contend that the notion or conception of anything in the mind, the act of mind by which we become aware of something, is the establishment in the mind of relations between that thing and other things, were it not that in the first of these quotations it is implicitly, and in the second it is explicitly, asserted that the establishment of relations need not enter into the process. In order that our demonstration may be crucial, let us take a very much simpler case than any of those adduced by the distinguished logicians quoted. Take the case of the simple apprehension of a colour or of a sound. Such an operation of the mind is not merely the establishment of a relation between two mental states, but involves in addition the establishment of a plurality of relations. Thus, when I am aware of the colour blue, I am aware that it is the colour to which I am in the habit of attaching that name only because I discern that it is like similar instances of colour of which I have previously been aware and to which I have previously attached that name. And I cannot be aware that this colour is like those other instances of colour to which I assimilate it without at the same time being aware that it is different from other colours which I designate differently. To have a notion or concept of blue, or to become aware of blue, is to establish a relation of likeness between this colour and certain other instances of colour, and a relation of unlikeness between it and yet other colours. Take away the assimilation between this instance of colour and other instances of blue colour, and the notion or conception or awareness of blue colour ceases to exist. Take away the discrimination between this colour and the other colours which are not blue, and all colours are fused in an indistinguishable tint, in which the separate tint of blue has no existence. Here we seem to have got down to the very bed-rock of the process of thinking, since it seems that we cannot discover any simpler process than the establishment of the simplest relations between the simplest terms. But this is by no means the whole of the process which

enables us to be aware of such a simple sensation as that of blue colour. It is known as blue colour because it is like other blue colours, and is unlike yellows, reds, and greens, and other colours that are different from it; but it is evident that it would never occur to me to distinguish it from yellows, reds, etc., unless I had already likened it to them. I do not deliberately discriminate the blue colour from smells and sounds and touches; and the reason that I do not so discriminate it is that I do not deliberately liken it to them. Antecedent to discrimination, then, there is a process of assimilation, and latent in the discrimination of blue from yellows, reds, browns, etc., is the assimilation of these colours to one another. But even this is not all; for the assimilation of yellows, reds, etc., into a similarity of sensation is necessarily accompanied by their discrimination from sensations of other orders, as smells, touches, sounds, etc.; and it is evident that the process can be carried several steps further back, and that all the passive sensations are assimilated to one another and discriminated from volitions, while all these relatively simple states of mind are assimilated to each other and discriminated from relatively complex states of mind, such as emotions, concepts of objects, etc., etc. That all these relations of likeness and unlikeness are, in fact, present in the mind in more or less prominence must be admitted, if it be admitted that the colour blue is, in fact, apprehended as being a simple sensation, a passive sensation, a sensation of colour, and a sensation of blue colour, since each such apprehension does, in fact, involve and necessitate the establishment of the relation of likeness and unlikeness between the several terms that have been enumerated. Nor is even this the whole of the process, which includes not merely the establishment of relations of likeness and unlikeness between simple mental states, but the assimilation and discrimination of relations between these relations. When I discriminate between blue on the one hand and yellow, red, brown, etc., on the other, it is evident that not only do I discern unlikenesses between blue and red, blue and yellow, blue and brown, etc., but that I assimilate these unlikenesses, and determine that the unlikeness between blue and red is like the unlikenesses between blue and yellow and between blue and brown, and is unlike the unlikenesses between blue and a taste, between blue and a touch, between blue and a sound; while these latter unlikenesses have, on the other hand, a similarity to each other. It is not asserted that these relations are explicitly present in consciousness in the apprehension

of blue colour, but they are there; they are implicit; they are involved in the apprehension of blue as a recognised colour different from other colours, and as a sensation belonging to the colour class.

If it seem improbable that so simple an apprehension as that of a blue colour should be in reality so highly complex a mental state as is here described, it is easy to point to other mental processes which appear to be extremely simple and yet are known to be extremely complex. It would seem that the visual apprehension of the difference in distance between the near end of a pole and the far end is given in consciousness as directly and with as little intermediation of simpler states as the apprehension of blue colour; and yet it has long been established that the former is in reality compounded of innumerable sensations of muscular strain and of innumerable relations between them, besides sensations of varying distinctness of vision and their relations, and of relations between the one series of mental states and the other.

Every process of thinking, inferring, judging, or reasoning is, therefore, the comparison of mental states and the establishment of relations of likeness or unlikeness between them; and the thought, inference, or judgment that results is the relation that is established. Moreover, in the developed intelligence, the mental states that are compared are themselves relations, and every process of thinking involves more or less direct and deliberate comparison of relations and establishment of relations between them.

Such being the nature of the process of thinking and of the thoughts that result therefrom, an analysis of the process and its results resolves itself into an examination of—

1. The relation.
2. The mode of establishing the relation.
3. The cohesion of the relation established.
4. The relation of the thought thus established to other thoughts.

THE RELATION

From what has been said it will appear that every exercise of thinking consists of the deliberate establishment of a relation, the less deliberate establishment of the reverse relation, and the still less deliberate assumption of a plurality of other relations, which have been antecedently established in previous mental operations. Every

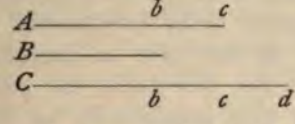
exercise of thinking begins with the establishment of a relation of likeness, and if the relation which is deliberately established, which we may term the primary relation, is a relation of unlikeness, this is a subsequent operation to which the formation of a relation of likeness is a necessary antecedent. For a sequence of thought so invariable there must be a physiological necessity, and it is not difficult to form a notion of the nature of this necessity. If, as has been supposed, the establishment in the mind of a relation of unlikeness is the mental equivalent of the separation of fasciculi of motion in the brain, then it is obvious that before fasciculi of motion can be separated, they must first have been brought together, and the bringing together of fasciculi of motion has for its mental accompaniment the establishment of relations of likeness. It seems therefore that while relations of likeness and relations of unlikeness are complementary of each other, and cannot either of them be formed without the formation of the other, yet of the two the relation of likeness is the most fundamentally important; and we shall find hereafter that, in the development of the thinking process which is termed reasoning, while relations of likeness may be deliberately established without any such deliberate establishment of relations of unlikeness, the converse process cannot be pursued, but that relations of unlikeness cannot be mediately established without the deliberate establishment of a relation of likeness.

To ascribe by means of a definition an exact meaning to the word likeness is not possible, since it is already a word of rudimentary simplicity, but it enters into expressions which are susceptible, if not of definition, of explanation, and there are several words which have allied meanings, whose meanings must be defined before we proceed to use them.

The expression that "the child favours his father more than his mother," an expression that, in this or allied forms, is not infrequent, carries the implication that there are degrees of likeness, and that a thing can be more or less like another thing; while it is evident that in another and stricter meaning of the words two things must be either like or unlike, and that no middle position is possible. If there is in any respect the smallest difference between two things, then they must be pronounced unlike. The confusion in the meaning of the term arises from want of care in its application. What is meant when it is said that two things are somewhat alike, or rather like, or not very unlike, is that some of their attributes are like and

some unlike, and it would seem that the degree of likeness depends upon the proportion which the like attributes bear to those that are unlike. A little consideration, however, shows that this is not the case. The attributes in which one man is like another man are innumerable, the attributes in which they are unlike are comparatively few, and yet how often is it not said that one man is very unlike another, that they do not resemble one another in the least, that there is no likeness between them? Of course, what is meant is, not that there are no features in which they are alike, for such features are innumerable, but that there is no likeness in those features in which they differ from other men; in other words, that they are unlike with respect to the features which are compared. In the features common to humanity they are alike, and this likeness must first be discerned before the unlikeness between them can be discriminated. When they are compared, the comparison is made, not between those qualities which are common to them and other men, but between those qualities in which each differs from the bulk of mankind; and it is the proportion between the number of likenesses and the number of unlikenesses in the qualities that are compared that determine the "degree of likeness" of the one man to the other. If we take a simpler instance we shall find that the statement still holds good.

Of the three lines *A*, *B*, and *C*, *A* is more nearly like *B* than is *C*.



If *bc* be the excess of *A* over *B*, and *cd* be the excess of *C* over *A*, then, when the three lines are compared, it is evident that while *Ab* and *Cb* are both like *B*, *Ac* is unlike *B* in respect of the part *bc*, while *Cd* is unlike *B* in respect not only of the part *bc*, but in respect of *cd* also. The unlikenesses between *C* and *B* are therefore more numerous than the unlikenesses between *A* and *B*, and it is by reason of the more numerous unlikenesses—of the greater proportion of unlikenesses in the qualities compared—that *C* is said to be more unlike *B* than *A* is. Degree of likeness is therefore a phrase, convenient if inaccurate, which designates proportion among the qualities compared of those that are like to those that are unlike.

When all the comparable qualities that the things possess are found

to be alike, then it is said that the things are identical, or that a relation of identity is established between them.

When qualities are compared quantitatively and are found to be alike in respect of quantity, they are said to be equal, and when unlike in quantity are said to be unequal, and this is true of all quantitative relations, whether susceptible of accurate measurement or no. We predicate equality and inequality not only of lengths, weights, durations, masses, and accurate quantitative ratios of all orders, but of all qualities which are quantitatively compared even when the quantitative relation is but vague. Thus we say that two towns are equally dirty; that two animals are equally odoriferous; that two statesmen are equally ambitious or unscrupulous; that two nations are equally brave; or unequally, as the case may be.

Allied to the relations of equality and inequality are the quantitative relations of majority and minority—relations expressed by the phrases *A* is greater than *B*, *B* is less than *A*. In these cases it is evident that something more is expressed than a quantitative unlikeness between *A* and *B*. There is predicated, not merely a relation of unlikeness and of quantitative unlikeness, but of a specific kind of quantitative unlikeness, and it seems as if this more definite relation of greater and less were given in consciousness in the same immediate intuition as is given the relation of unlikeness. When a given line *A* is discovered to be longer than a given line *B* to which it is applied, the discernment of the majority of *A* appears to be simultaneous with the discernment of inequality, and to rest upon as immediate an intuition; but this can scarcely be so. No doubt, the power of discerning these relations is a very early acquirement, but still, it has to be acquired. By a rudimentary intelligence the discernment that *A* is unlike *B* must precede the discernment, which it underlies, that the difference between *A* and *B* is a quantitative difference; and this again must precede the discernment that the quantitative difference is one in which *A* has the advantage; and at either of these stages the development may, and most probably does, remain stationary for a longer or shorter period. Only by the assimilation of gradually accumulated instances of the relation does the apprehension of a relation of majority or minority gradually emerge from that of a relation of quantitative unlikeness, just as this latter relation was gradually distinguished from the general relation of qualitative unlikeness. Only gradually is a relation of quantitative unlikeness discriminated from relations of

qualitative unlikeness; only gradually are relations of majority and minority seen to be unlike the general relation of quantitative unlikeness. When the developed intelligence discerns that *A* is greater than *B* and *B* less than *A*, the process of thought is that *A* is unlike *B*, and that the unlikeness between *A* and *B* is like the unlikenesses, often previously experienced, between greater things and less things.

The relations of simultaneity and sequence bear the same relation to each other as the relations of equality and majority. Equality is likeness in quantity; simultaneity is likeness in the times of occurrence. As unlikeness in quantity is inequality, so unlikeness in the times of occurrence is non-simultaneity. As majority and minority are special cases of inequality, so antecedence and sequence are special cases of non-simultaneity; and as majority and minority are gradually specialised out of the more general relation of inequality, so antecedence and sequence are gradually specialised out of the more general relation of non-simultaneity. Of course, it is not pretended that any such general relation as that of simultaneity or non-simultaneity is *formulated*—is recognised and named—before the relations of antecedence and sequence are apprehended. All that is asserted is that before the establishment of the special relation "this happened before that" there must have been an establishment of the more general relation—"the time at which this happened is different from the time at which that happened." The relation of difference between the times is a simpler and more easily established relation than the relation of likeness between this sequence and other previously experienced sequences; it is not only simpler and more easily established, but it is included in, and is, therefore, necessarily antecedent to, the more exact and more complex relation.

When it is said that the simpler relation is included in the more complex, it is evident that it is included as a correlative term or as part of a correlative term in this relation. Fully set forth, the establishment of a relation of sequence is "this unlikeness in the times of occurrence of phenomena is like (in certain respects) other cases of unlikeness in times of occurrence (to which the name of sequences has been given)." Similarly in every case in which a thought is complex, the complexity resides in the terms and not in the relation itself, which is always a relation of likeness or unlikeness, and it is easy to compose a long series of thoughts in which the complexity gradually increases until it attains a very high degree, and in which the last and

most complex, as well as the first and simplest, remains a relation of simple likeness or unlikeness.

If a musical tone is followed by another musical tone, a comparison may be made between them, and a judgment formed of the likeness or unlikeness that subsists between them. If two other musical tones are experienced, they also may be compared and another judgment formed as to their likeness or unlikeness to each other. Each of these judgments may now become a term in another comparison, and a judgment or relation may be formed as to the likeness or unlikeness of the interval between the first pair of tones to the interval between the second pair. By an extension of the same process, one musical phrase may be compared with another; one cantata or oratorio with another; all the compositions of one composer with those of another; all the works of all the composers of one school, or country, or age, with those of another; the progress of a nation in musical composition may be compared with its progress in other arts; and so on in a series of continually increasing complexity. The complexity, it will be seen, resides always in the terms of the relation of which the thought consists, the relation itself maintaining its original simplicity as a relation of likeness or of unlikeness. It is true that in very many cases complex relationships are dealt with in thought, as in the instances already cited, of relations of equality and inequality, majority and minority, simultaneousness and sequence, etc.; but in all such cases the relation can be resolved into relations of likeness and unlikeness, and so it is possible, though it is not always convenient, to transfer the complexity from the relation to the terms between which it subsists.

THE ESTABLISHMENT OF RELATIONS: THINKING

"All the business of war, and, indeed, all the business of life, is to endeavour to find out what you don't know by what you do."—DUKE OF WELLINGTON.

The establishment of relations between mental states is the process of thinking, and although, as we have seen, all relations are ultimately analysable into relations of likeness and relations of unlikeness, which would seem to limit the possible varieties of thought to two, yet when we investigate the thinking process we find that we are able to discriminate more or less completely six or seven varieties, which are

distinguished, some by the nature of the relation, as one of likeness or of unlikeness, some by the number of relations directly compared in the same act of thought, and some by the consideration whether, and the degree in which, the homologous terms of the relations as well as the relations themselves are assimilated.

In every case of thinking the mental states which are compared are themselves relations between simpler states, and even the simplest conscious states that are experienced by a developed mind are, as we have seen, of considerable complexity. But these mental states, or terms between which relations are established in the process of thinking, are variously dealt with in this process. The relation, as it enters as a term into the new relation, may enter it as a simple state, its composite nature being ignored, and itself dealt with as a simple unit. The constitution of the new relation then belongs to the simple type $A : B$. It matters not how complex in fact A and B may each of them be, each of them enters the new thought as a unified whole. Such is the constitution of the thought, this shade of blue is like that, and such is the constitution of the thought, this nation is more capable of self-government than that.

But the constitution of the terms of the thought is not always ignored. There are large classes of thoughts whose terms are not only compound, but are regarded in the thought as compound; terms which enter into the composition of a thought, not as simple units, but avowedly and explicitly as relations between such units. The type of thought is then not $A : B$, but $(a : b) : (c : d)$. Such is the constitution of the thought (the relation of the parson to his parishioners) is like (the relation of the shepherd to his flock) or, (the relation between the trunk of a tree and its limbs) is unlike (the relation between the trunk of a man and his limbs).

When the thoughts are of this type, they differ according to the degree in which the homologous terms of the two subsidiary relations are assimilated. When the relations alone are assimilated, with no, or with a minimum of assimilation of the homologous terms, the process of thought is termed Analogy.

When the homologous terms are assimilated, when, that is to say, not only is $a : b$ compared with $c : d$, but a is assimilated to c, and b to d, then several other varieties of thought are constituted.

When the assimilation of the homologous terms is given as a datum, when, that is to say, it is antecedent to the process of thought now in

progress, and forms no part of the actual process in being, then occurs a process of thought which may be termed proportional inference, the type of which is $(a : b)$ is like $(a' : b')$. As an instance we may give the comparison between the boiler power required to heat two greenhouses with the power required to heat three similar houses to the same extent. In this case it is evident that before the process of thought can begin, the homologous terms of the relations must already be assimilated. There could be no comparison between the boiler power required to heat the houses by hot water and the quantity of current necessary to heat them by electricity. Nor could there be a comparison between heating two greenhouses and walking ten miles. But the assimilation of the homologous terms is no part of the act of thought by which the conclusion is reached that more power is required in the one case than in the other. The assimilation is effected before this process of thought begins.

It is evident that this type of reasoning may be still further complicated, and that either or both the terms of the subsidiary relations may themselves be relations. For instance, we may desire to find the proportion between the boiler power required to heat two greenhouses to twenty degrees above the outside air and that required to heat three greenhouses to fifteen degrees above the same standard. The form of the thought will then be $\{a : (b : c)\} : \{a' : (b' : c')\}$, and further complications can easily be introduced, as in the compound rule of three sums in the arithmetic books. Throughout all this complication the character of the thought, as the direct comparison of two ratios, remains the same, however complicated the ratios become.

The next form of thought is like the last in that two relations are compared and their homologous terms are assimilated; but in this case the homologous terms are not given alike. Their assimilation is a part of the very act of thought by which the relations themselves are assimilated, and is the means by which this assimilation takes place. The form of thought now is $\begin{matrix} A : B \\ \vdots \\ a : b \end{matrix}$ The relation $a : b$ is, as a whole, assimilated to $A : B$; but in order to effect this assimilation it is necessary first of all to liken a to A, whereupon the rest of the assimilation follows as of course. This case differs from the last in that the process of thought, the effort of mind, the active part of the process, is the assimilation of the homologous terms a and A, after which the

assimilation of the relations follows without effort. In the previous case the assimilation of the homologous terms was of course, and the active process of thought was in the subsequent stage, in the comparison of the relations themselves.

Such is the form of the process by which we infer that, since other birds have been found to be warm-blooded, this bird will be found to be warm-blooded. In this case, not only do we assert the relation between this bird and a high temperature is like the relation between other birds and a high temperature, but also, and before we can establish that relation, we assert that this bird is like other birds. The process of thought begins in the actual explicit comparison and assimilation, not of the principal relations, but of one pair of the homologous terms.

In the case just instanced we advance beyond the comparison of two relations, and find that in the same act of thought we are able to perform a double process of assimilation; we are able to assimilate not only the relations as wholes, but their homologous terms as well. In the next form of thought the process becomes still more complicated. In it we compare three terms, and entertain relations of the same order among the three, each term entering into relation with both the others. In this case the form of thought is peculiar, and can be best expressed thus—

$$\begin{array}{ccc} & b & \\ \cdot & & \cdot \\ \cdot & & \cdot \\ a & : & c \end{array}$$

We have seen in the simpler form that the terms of the relations may enter into the thoughts as units or that their relational form may be expressed and avowed in the relation; and this variety in the explicit composition of the term exists in this more complex as in the simpler mode of thinking. When the terms of the relations are units, or at least enter as units into the composition of the thought, then this triple relation is the form of the syllogism, and of axiomatic reasoning generally, examples of which are scarcely needed.

When each of the three terms is itself avowedly and explicitly a relation, and enters as a relation into the process of thought, then the form of thought is—

$$\begin{array}{ccc} & A : B & \\ \cdot & & \cdot \\ \cdot & & \cdot \\ a : b & : & a' : b', \end{array}$$

a mode of thought to which I confine the term Mediate Inference, examples of which will be found in abundance when this mode of reasoning is dealt with.

We may now proceed to deal in detail with these various modes of thinking, and we shall find it convenient to take them in a different order from that in which they have just been enumerated, letting the consideration of the syllogism follow upon that of the other modes in which the terms of the relation are simple, then proceeding to the consideration of the relations whose terms are relations, and finally, to the forms in which not only the relations themselves, but their homologous terms are compared.

SYNCRISIS

(Form of Thought, *A* : *B*)

I. ABSTRACTION

When a presentation is made to sense, it is apprehended by a rudimentary intelligence as a single presentation, as an undivided whole; but as intelligence advances, unlikenesses begin to be discriminated, and when, in the developed intelligence, discrimination of unlikenesses is sufficiently complete, separated elements in the presentation are represented, dissociated more or less completely from the representation of the other elements. Thus, to begin at an advanced stage in the process, when a yellow flower is seen, it is possible to discriminate the yellowness from the size, shape, odour, surface, texture, and other presented attributes, and to represent it in comparative isolation from them. This discrimination of the yellowness of the flower from its other attributes is the abstraction of the yellowness; and when the yellowness is represented or remembered with a minimum of representation or remembrance of the other attributes, the representation is called an abstract idea or thought.

It is evident that the extent to which this dissociation or isolation or abstraction of one representation from others can be carried, varies much in different cases, and that there are degrees of abstractness of thought. We have to determine the circumstances which render abstraction possible, and those which determine its degree.

When a person sees for the first time a solution of quinine, he notices in the liquid, unless he is of very unobservant habit, a peculiar sheen or play of greenish light, which he has probably never seen

before. Enabled by previous practice in other instances, he at once discriminates this quality from the liquidity, transparency, and other qualities of the solution, and the discrimination and isolation of this quality from the other qualities is a process of abstraction, and the resulting thought is an abstract thought. It is a thought of a low degree of abstractness however, for although the fluorescence can be discriminated from the other properties of the liquid, the representation of it clings to the representation of these other properties with great tenacity. It is not possible to remember the fluorescence without remembering also the liquidity and the transparency of the medium with which it is associated in experience—nay, if it has been seen but once, the very shape of the bottle clings in memory to the fluorescence. But while the cohesion between the memory of the fluorescence and those of the liquidity and transparency is strong, the cohesion between it and the memory of the bitter taste is much less strong. It is only occasionally that the memory of the bitter taste arises in association with that of the fluorescence, and if we seek the explanation of this difference in the cohesion of the memories in a difference in the experience, we shall find that, while the observer has seen the solution on perhaps a dozen different occasions, he has tasted it but once or twice. Clearly, therefore, the ability to abstract a memory from other memories depends, in this case, upon the constancy with which the one mental state has been presented in association with the other mental state. If, therefore, we can find a substance in which fluorescence is present, but from which any of the qualities present in the solution of quinine are absent, it may be supposed that we shall be able to abstract the memory of fluorescence from the quality or qualities from which it is dissociated in this new experience. And this we find to be the case; for having witnessed the fluorescence of fluor spar, we are able to dissociate its memory from the memory of liquidity, and thus gain a step in the abstractness of the thought. After experience of the fluorescence of canary glass, we are able to dissociate the memory of fluorescence from the memory of colourlessness in the medium in which it is displayed, and so to form a thought one degree more abstract still. Thus it appears that thoughts become more abstract with each diminution in the number of the presented states with which they are found to be constantly associated; and the most abstract thoughts are those in which the process of discarding inconstant associates has been most often repeated, in which the severance of

young child; or it may be that although the associations between increasing loudness of sound and approach of the sounding body, between approaching bodies and impact, between impact and damage, have all been organised, yet from defect of memory they are not aroused upon the occurrence of the appropriate stimulus. In either case we may call the defect Imperception.

Imperception scarcely occurs as an isolated defect; but as a manifestation of privation of mind in Idiocy, and of loss of mind in the deeper degrees of Dementia, it is common enough. A person of normal mind, on receiving a cup of steaming tea, will assimilate the incident with previous experiences in which he has found steaming tea to be scalding hot. The dement or the idiot will execute no such process of thought. He will not perceive the temperature of the fluid until he has scalded his mouth with it. A man of normal mind, who wakes in the night and finds himself naked, will perceive that the bedclothes lying beside him have the attributes of warmth and mobility, and will pull them over him to the increase of his comfort. The dement or the idiot will attribute no such qualities to the mass beside him, and will freeze for want of the perception. A normal person will perceive that the boot, that he is trying to drag on to his right foot, has the shape which fits it for his left, and will modify his procedure accordingly. The dement or the imbecile will make no such distinction, but will tug at it till he breaks the tag. A normal individual above the age of four or five, who has once tasted mustard, or scalded itself with hot water, or burnt itself with a live coal, will shun contact with these substances in the future; but a dement, an idiot, or a low-grade imbecile will exercise no such caution. He will not associate the noxious quality with the appearance. He will not assimilate the present to the past experience. He will not perceive the harmful attribute of the object.

Errors of perception also are very common; that is to say, an impression received arouses, and has added to and combined with it, memories of attributes which have been previously found associated with similar impressions, but which are not, in fact, associated with the present impression. We read into a thing qualities which it does not possess, or we attribute to an appearance a meaning that it has not. An insect comes buzzing around my head, an insect somewhat bigger than a bee, with a yellow body and a beelike flight, and I immediately perceive that it is a wasp. Its attentions becoming embarrassing,

I knock it on to the floor, and as it crawls there, I see it is not a wasp, but a syrex. My first perception was erroneous. To the impressions made on my senses I added the memories of vespine attributes previously found associated with similar impressions, and the group of presentative-representative attributes thus constructed formed the percept—the erroneous percept—of a wasp. It may, of course, be said that I did not perceive, but inferred, that the insect was a wasp, and it would not be incorrect to call the process an inference; but then we must remember that perception includes inference; it is a simple case of inference, as will presently be set forth. Had the insect, in fact, been a wasp, it would admittedly have been correct to say that I perceived it to be one; it cannot, therefore, be incorrect to call the same process, when erroneous, by the same title. I am standing in a crowded room, and I hear behind me the familiar voice of a friend talking in his animated emphatic way, and with his marked Scotch accent. I perceive that the voice is my friend's voice, that is to say, to the sense impression that I receive, I add memories of my friend's appearance and other qualities—memories that go to make up my concepts of distance, position, and so forth; and the combination of these memories with the sense impression of sound is the perception that a pace or two behind me my friend is speaking. I turn round to greet him, and find that the owner of the voice is a stranger. The perception is erroneous. In this, as in the previous case, we shall be prone, after we have discovered the error, to call the process not perception, but inference, the reason being that the discovery of the error brings prominently before us the considerable share that inference has in perception; but whether recognised or no, inference is always present in perception; and if it is right to call the process perception when it is correctly performed, it is right to call it by the same title when it is erroneous.

Mill has distinguished very clearly the large amount of inference that enters into perception (*Logic*, vol. ii., 8th ed., p. 186), and shows that what he calls "errors of sense," or what are called here errors of perception, are "erroneous inferences from sense." "When I look at a candle through a multiplying glass, I see what seems a dozen candles instead of one; and if the real circumstances of the case were skilfully disguised, I might suppose that there were really that number. . . . If I cross two of my fingers, and bring any small object, a marble, for instance, into contact with both, I can hardly, if my eyes

and the whole bundle, comprising relations of position in space, of attachment to the ground, of form, size, colour, texture, etc., etc., of the tree as a whole, and of its several parts—branches, leaves, flowers, etc., etc., forms the percept of the tree. Withdrawing my gaze from the tree to the paper on which I am writing, I still have a consciousness, now wholly representative, of the bundle of attributes, a consciousness which is a memory of the tree. Both the percept and the memory are particular ideas. The presence in consciousness of this group of attributes drags into consciousness similar groups which have been previously experienced, or, as we say, calls up the memory of previously seen laburnum trees, and the memories are discerned to be alike in certain respects; that is to say, certain attributes abstracted from the group which forms the memory of this tree are assimilated to attributes abstracted from the groups which form the memories of other laburnums, and the assimilation of these groups of abstracted attributes is the process of generalisation, while the group of assimilated abstracted attributes is a general thought or general idea of laburnum trees.

The general thought of laburnum trees contains of necessity a smaller number of component memories than does the particular thought of a certain laburnum tree. The memory of the particular position in space and of particular special relations to surrounding objects is discarded. The memory of this broken branch, of that excrescence on the trunk, and of all attributes in which this tree differs from other laburnum trees must be discarded, and the group that remains in the general thought is of necessity more restricted than the group that composes the particular thought.

With this more restricted group of attributes the process can be repeated. The attributes of woodiness, of attachment to the soil, of ramification, and so forth, may be detached from the group which constitutes the general idea of laburnums, and may be assimilated to like attributes detached from the groups which constitute the memories of other trees, and by this fresh process of generalisation is formed a general idea of trees. In this new idea the memories of particular attributes are of course less numerous than those which compose the general idea of laburnums, and at the same time the number of groups of attributes that are assimilated by the discernment of this common possession of the abstracted attributes is increased. The number of attributes common to laburnums alone is greater than the number of attributes common to laburnums and other trees; and the number

of trees, including laburnums, is greater than the number of laburnums alone. Every step in generalisation is a reduction in the number of assimilated attributes, and is at the same time an increase in the number of objects grouped together in the generalisation.

Instead of discriminating the attributes of woodiness, ramification, etc., from the general idea of laburnums, I may choose another sub-group, and may discriminate certain peculiarities of flower, leaf, and fruit, and, assimilating these to like attributes in other plants, I may form a general idea of papilionaceæ, in which an increase in the number of objects grouped together in the generalisation is again concomitant with a decrease in the number of attributes abstracted. But of the restricted groups of attributes that constitute the general idea of papilionaceæ may be again abstracted the attributes of vegetable life, plus the attribute of the possession of a fruit with two cotyledons, and thus is formed a general idea of a still larger group of objects characterised by a still smaller group of common attributes, and so the process may be continued.

It will be seen that, although the number of individual instances that are included under a general idea increases with the degree of generality, yet the degree of generality of an idea by no means depends upon the number of individual instances that are included under it. There are many more daisies in the world than there are cedar trees, but the general idea of garden daisies is not of greater generality than the general idea of cedar trees. Nor does the generality of the idea depend upon the fewness of the attributes that are assimilated, for the attributes whose assimilation forms the general idea of needles are much less numerous than those whose assimilation forms the general idea of birds, and yet the idea of birds is not less, but more general than that of needles. What determines the generality of an idea is the diversity of the instances that are included under it, that is to say, the magnitude and number of the differences between these things. If the idea of trees is more general than that of cedars or of laburnums, it is not because trees are more numerous than either cedars or laburnums, nor because the attributes common to trees are less numerous than those common to cedars or laburnums respectively; it is because the differences among trees *inter se* are more numerous and wider than the differences between cedars *inter se* or laburnums *inter se*. If the idea of birds is more general than the idea of needles, it is not because there are more birds than needles, nor because the

between the weight of falling bodies and the ratio of their weight to their bulk. So, that objects immersed in water are always magnified, without regard to the form of the surface, is an error, not of observation, but of memory, for many instances have been perceived in which immersed objects were not magnified; but, at the time the statement is assented to, these instances are not represented with sufficient faithfulness to contradict the statement. It would be an error of observation if, only, upon attention being voluntarily given to an object lying at the bottom of water, the observer adjudged the apparent size of the object so seen to be greater than it would appear at the same distance when viewed through air. A somewhat similar criticism exposes the nature of the error in the belief of the negroes, that a coral amulet becomes paler in colour when its wearer is affected by disease. This is regarded by Mill as a fallacy of observation. "On a matter open to universal observation, a general proposition which has not the smallest vestige of truth is received as a result of experience." But it is clear that the error is not one of observation. The colour of the coral can be known to be paler, only by comparing the colour which it is now observed to exhibit, with the colour that it exhibited aforetime when its wearer was in health. But this previously borne colour is known only by memory. No record of it was taken. No similarly coloured coral was preserved for comparison. What is compared is the presented colour with the represented colour, and if a non-existent difference is discriminated between them, this can only be by error in the representation of the previously experienced sensation. In other words, the error is one not of observation, but of memory. It would be an error of observation if the colour which the coral now presents were observed to be other than it actually does present; but it cannot be pretended that this is the case.

Such instances as these are evidently not instances of faulty observation properly so called. Let us now take some instances to which the term may be more appropriately given. Supposing that I want to ascertain, before I move it, whether a certain cabinet will fit into a certain recess. I measure the width of the cabinet, and find that it is 4 feet wide. I measure the recess and find that it is 4 feet 2 inches, and I decide that the cabinet will stand in the recess. I therefore make the trial, and find that I am mistaken. The cabinet will not enter the recess, for I have omitted to take into account the projection of the skirting; and although the recess is 4 feet 2 inches at the level

at which I measured it, at the floor-line it is diminished, by the projection of the skirting, to 3 feet 11 inches. The omission to take into account the projection of the skirting may fitly be called a defect of observation. I turned my attention spontaneously to the comparative widths of the cabinet and of the recess, and deliberately compared them, but I failed to compare the widths at each part of the height, although every part of the height of the cabinet was to fit into the recess. The neglect of attention may properly be called neglect or defect of observation. In this case, although an important factor escaped my observation, yet what I did observe I observed correctly. I did not measure all the distances that I ought to have measured, but those that I did measure I measured correctly. But let us suppose that the recess is 3 feet 1 inch in width, and that I measure it with a two-foot rule; and suppose that after marking off 2 feet, I measure the remainder, and read off the wrong side of the rule, making the additional distance 11 inches instead of 13 inches. By addition of the two lengths I arrive at the result that the recess is 2 feet 11 inches in width, whereas in fact it is 2 inches wider. This would ordinarily, and not incorrectly, be called an error of observation, and yet the observation, in as far as noting the particular division between the inches and the particular number attached, was correct. The error was in neglecting to observe that the instrument was wrongly adjusted; and this may properly be called defect of observation, or non-observation, rather than error, or mal-observation. But if we trace the source of the error further, we shall find that it was a lack of discrimination, a failure to distinguish between the different modes of numbering the different sides of the rule. If I had previously known that the two sides of the rule were numbered from different ends, the failure may be called a failure of memory; if I had not this previous knowledge, I ought to have made sure, before taking the number of inches, from which end the numbering began. In this case again the lack was a lack of attention; but even in this case a lack of discrimination pre-existed, for I must previously have considered that the rule might be numbered from either end. In the case of observation, as in the case of perception, therefore, what seems to be a very simple error or defect may, when analysed out, be apportionable to a plurality of mental processes.

I am trying to describe the appearance of a lady whose name I wish to know, and I am asked whether I mean the lady with the violet

flower in her bonnet. I reply that I "cannot remember," or "did not observe," whether she had a bonnet on at all, and certainly am ignorant of the colour of the flower therein, supposing that there was one. It would probably be agreed that this is a failure to observe, but wherein does the failure consist? Undoubtedly I did not observe the flower in the proper sense that I did not direct voluntary attention towards it; but if this non-observation is to be regarded as defective observation, it should first be shown that there was some reason why I should have directed attention towards it. Until this is done, the non-observation is not defect. If at the time I spoke to its wearer, my attention had been reflexly attracted to the bonnet, so that I perceived it, but I did not direct voluntary attention to it, then I am right in saying that I do not remember it, as well as that I did not observe it; but if I did voluntarily attend to it, and still do not know what it was like, then the failure is a failure of memory only, and not of observation.

Errors of observation so called, errors of observation in the sense in which Mill uses the term, often occur in the comparison of experiences that are not simultaneous, that is to say, when a percept is compared with a memory; and still more often when memories are compared together. Most Englishmen, if asked which is the month of greatest rainfall, would name "February fill-dyke"; whereas, in the experience of most of the inhabitants of these isles, the month of most rainfall is October, and in that of the rest it is August. Here it seems that error of observation means defect of memory, but closer examination will show that the mistake really is due to defect of observation in the strict sense of the term; that is to say, that the reason why the greatest rainfall is attributed to the wrong month is that, as the wet days occur, people do not voluntarily direct their attention to the relation between the rainfall and the time of year. All they do is to allow the attention to be reflexly attracted to the matter, and thus it cannot be said that the comparative amounts of rainfall have ever been properly observed at all. February is a cold month, and therefore a month in which the wet soil does not readily dry, and the fact that it is usually wet under foot in that month has led to the *inference* that in that month the rainfall is heavy. For generations it has been believed that food cooked in copper vessels is poisonous, the fact being that persons have been poisoned and that it has been *inferred* that the poison was copper. This would be a mal-observation in Mill's sense,

but of course it is an erroneous inference. Of many beliefs, such as that the weather changes with the moon, that the death-watch forebodes a death in the house, that a peacock's feather is unlucky, that "mistes in March bring frostes in May," and a thousand others, it is not so much true that they are founded upon mal-observation as that they could be destroyed by correct observation. It is doubtful whether observation had anything to do with their origin, and their continuance is no doubt due to the lack of it.

Lastly, erroneous perception is sometimes called erroneous observation. When a scale of the gnat is examined under a high power of a microscope, it is seen to be traversed by longitudinal ridges and crossed by transverse wrinkles. These appearances are constant, but in addition there appear, in certain arrangements of light and of focus, between each pair of longitudinal ridges, three parallel rows of beads, which were supposed to be elevations upon the surface of the membrane. It has long been proved that the beaded appearance is due to interference of the light waves by the ridges and wrinkles upon the surfaces of the scale, and the perception of the beaded elevations was called an error of observation. The instant addition to this appearance, of the qualities which have constantly been found associated with it in experience, is perception; and the rôle of observation, as soon as observation is introduced into the process, is, with the aid of inference, to correct the error of perception.

AXIOMATIC REASONING

FORM OF THOUGHT. $\begin{matrix} & b & \\ \therefore & & \therefore \\ a & : & c \end{matrix}$

THE SYLLOGISM

For twenty centuries this venerable figure has been the umbilicus of logical doctrine. Towards it has been turned the regard of every investigator in the field of logic, and around it have all the conflicts of logicians raged. Whether it was deified as the UNIVERSAL PRINCIPLE of reasoning, or whether it was damned as possessed of the devil of *petitio principii*, it was at least the hero of the conflict. It is not thirty years since the founder of the modern English school of philosophical thought declared, after a searching investigation of its claims,

that though it might not be the type, it was yet the test of all reasoning. Since that time the syllogism has been sensibly declining in importance, and it has become possible for an acknowledged and eminent authority, Mr. Venn, to write a very complete and admirable treatise upon logic of nearly six hundred pages in length, of which eight only are devoted to the syllogism. Although in another work (*Symbolic Logic*) Mr. Venn refers to the syllogism as one case only of a more general form of reasoning, yet neither he nor, as far as I know, anyone else has examined the whole of the processes of thought with a view to determining their relations to one another and the position of the syllogism among them. It is not yet decided even whether the syllogism is a process of inference at all, or whether it is not an impostor masquerading in a garb which it has no title to wear.

Nothing could be more perspicuous than J. S. Mill's examination of the claims of the syllogism to be "a process of inference: a progress from the known to the unknown: a means of coming to a knowledge of something which we did not know before."

"Logicians," says he, "have been remarkably unanimous in their mode of answering this question. It is universally allowed that a syllogism is vicious if there be anything more in the conclusion than was assumed in the premises. But this is, in fact, to say that nothing ever was, or can be, proved by syllogism which was not known, or assumed to be known, before. Is ratiocination, then, not a process of inference? And is the syllogism, to which the word reasoning has so often been represented to be exclusively appropriate, not really entitled to be called reasoning at all? This seems an inevitable consequence of the doctrine, admitted by all writers on the subject, that a syllogism can prove no more than is involved in the premises. Yet the acknowledgment so explicitly made has not prevented one set of writers from continuing to represent the syllogism as the correct analysis of what the mind actually performs in discovering and proving the larger half of the truths, whether of science or of daily life, which we believe; while those who have avoided this inconsistency, and followed out the general theorem respecting the logical value of the syllogism to its legitimate corollary, have been led to impute uselessness and frivolity to the syllogistic theory itself, on the ground of the *petitio principii* which they allege to be inherent in every syllogism." While he does not admit that the syllogism is useless and frivolous, he goes on to say that, "It must be granted that in every syllogism, considered

as an argument to prove the conclusion, there is a *petitio principii.* When we say—

All men are mortal,
Socrates is a man,
therefore
Socrates is mortal,

it is unanswerably urged by the adversaries of the syllogistic theory that the proposition, Socrates is mortal, is presupposed in the more general assumption, All men are mortal; that we cannot be assured of the mortality of all men unless we are already assured of the mortality of every individual man; that if it be still doubtful whether Socrates, or any other individual we choose to name, be mortal or not, the same degree of uncertainty must hang over the assertion, All men are mortal; that the general principle, instead of being given as evidence of the particular case, cannot itself be taken for true without exception, until every shadow of doubt which could affect any case comprised with it is dispelled by evidence *aliundè;* and then what remains for the syllogism to prove? That, in short, no reasoning from generals to particulars can, as such, prove anything: since from a general principle we cannot infer any particulars but those which the principle itself assumes as known.

"This doctrine appears to me irrefragable; and if logicians, though unable to dispute it, have usually exhibited a strong disposition to explain it away, this was not because they could discover any flaw in the argument itself, but because the contrary opinion seemed to rest on arguments equally indisputable. In the syllogism last referred to, for example, . . . is it not evident that the conclusion may, to the person to whom the syllogism is presented, be actually and *bonâ fide* a new truth? Is it not matter of daily experience that truths previously unthought of, facts which have not been, and cannot be, directly observed, are arrived at by way of general reasoning? We believe that the Duke of Wellington is mortal. We do not know this by direct observation, so long as he is not yet dead. If we were asked how, this being the case, we know the Duke to be mortal, we should probably answer, Because all men are so. Here, therefore, we arrive at the knowlege of a truth, not (as yet) susceptible of observation, by a reasoning which admits of being exhibited in the following syllogism:—

All men are mortal,
The Duke of Wellington is a man,
therefore
The Duke of Wellington is mortal.

And since a large portion of our knowledge is thus acquired, logicians have persisted in representing the syllogism as a process of inference or proof, though none of them has cleared up the difficulty which arises from the inconsistency between that assertion and the principle, that if there be anything in the conclusion which was not already asserted in the premises, the argument is vicious."

The length of the pregoing extract is fully justified by the admirable clearness of the argument it presents. It was necessary to state the argument in this place, and he would be presumptuous who should suppose that he could state an argument more perspicuously than J. S. Mill. We must be indebted to him for some further extracts.

"From this difficulty there appears to be but one issue. The proposition that the Duke of Wellington is mortal is evidently an inference; it is got as a conclusion from something else; but do we in reality conclude it from the proposition, All men are mortal? I answer, No?"

In this answer I should entirely concur with Mill, and omitting a statement with which I cannot agree, and which is immaterial for the present purpose, I take up the thread of his argument again:—

"Assuming that the proposition, The Duke of Wellington is mortal, is immediately derived from the proposition, All men are mortal, whence do we derive our knowledge of that general truth? Of course, from observation. Now all which man can observe are individual cases. From these all general truths must be drawn, and into these they may be again resolved; for a general truth is but an aggregate of particular truths; a comprehensive expression by which an indefinite number of individual facts are affirmed or denied at once. But a general proposition is not merely a compendious form for recording and preserving in the memory a number of particular facts, all of which have been observed. Generalisation is not a process of mere naming; it is also a process of inference." So far Mill carries with him my complete concurrence, but at this point we begin to diverge. He now enters upon ground on which I am unable to follow him, and, as it seems to me, just misses the true appreciation of the facts. "From instances which we have observed," he says, "we feel warranted in concluding that what we found true in those instances holds in all similar ones, past, present, and future, however numerous they may be. We then, by that valuable contrivance of language which enables us to speak of many as if they were one, record all

that we have observed, together with all that we infer from our observations, in one concise expression; and have thus only one proposition, instead of an endless number, to remember and communicate . . . When therefore we conclude, from the death of John and Thomas and every other person we ever heard of in whose case the experiment had been fairly tried, that the Duke of Wellington is mortal like the rest, we may indeed pass through the generalisation, All men are mortal, as an intermediate stage; but it is not in the latter half of the process, the descent from all men to the Duke of Wellington, that the *inference* resides. The inference is finished when we have asserted that all men are mortal. What remains to be performed afterwards is merely deciphering our own notes."

It is not a little remarkable that so wonderfully acute and clear-headed a thinker as Mill should fall into the confusion that appears to exist in this reasoning, and should so narrowly miss what seems to be plainly the true interpretation of his own statement; and it is the more remarkable, since his error lies in the tenacity with which he clings to the expression, All men are mortal, as the mental relation which is a necessary part of the inference, although he seems more than once on the point of abandoning it, and although upon his own showing, it is neither necessary nor true. Let us examine seriatim the statements in the last paragraph quoted.

"From instances which we have observed, we feel warranted in concluding that what we have found true in those instances holds true in all similar ones, past, present, and future, however numerous they may be." Impressed with the necessity of establishing the relation, All men are mortal, Mill endeavours in this sentence to justify this assumption. But is the process that he describes sufficient to justify it? Are we warranted in concluding from instances that we have observed that what we found true in those instances holds true in all similar ones, past, present, and future, however numerous they may be? And if we are warranted in drawing this inference, what are the grounds of our warrant? Supposing that, instead of the instances of the association of mortality with man, we observe instances of the relation of the possession of ten fingers with man. Are we warranted in concluding, from the instances of ten-fingeredness that we have observed, that All men, past, present, and future, however numerous they may be, have had, have, and will have ten fingers, neither more or less? Certainly not. Some are born with eleven fingers and some with twelve. Some have

one finger chopped off, some have two fingers shot off, some have three fingers crushed off, and so are left with nine, eight, and seven respectively. We cannot infer, we are not justified in inferring, from instances, however numerous, that All men are ten-fingered; and the reason why we are not warranted in drawing this inference is that *the relation is not constant in experience.*

It is not true, therefore, that we feel warranted in concluding from instances that we have observed that what we found true in those instances holds true in all similar ones. We do not feel any such warrant. But it may be said, This is tying Mill down too strictly to the literal terms of his argument. What he evidently meant was that from instances which we have observed, *which have included no exceptions*, we feel warranted in concluding, etc. Now, in the first place, this is an argument which Mill himself would have been the last to use. Few men have ever cultivated, to such perfection as Mill, the art of expressing in words the precise thoughts in their minds, and it is not permissible to suppose that any statement of his is not to be received without a gloss. But in the second place, even if the statement be thus qualified, it is still not true. Were it so, we should have felt warranted in concluding a few years ago that all planets and satellites in the solar system, already discovered or to be discovered in the future, circulate about their principals from west to east. But this conclusion would have been erroneous. If Mill had not felt himself tied to the expression, All men are mortal, and bound to discover a warrant for it; if he had not been still partly in bondage to the form of the syllogism, which he had only in part rejected; if he had pursued his inquiry in freedom from the self-imposed necessity of discovering *why* we infer that All men are mortal—he could scarcely have failed to discover that no such inference is necessary to the discovery that the Duke of Wellington is mortal, and that, in fact, the latter conclusion is reached without the aid of the former, which does not enter into the argument at all.

When Mill says that we derive our knowledge of a general truth from observation, he is unquestionably correct. When he says that all which man can observe are individual cases; that from these all general truths must be drawn, and into these they may be again resolved; that a general truth is but an aggregate of particular truths—he is unquestionably right. When he says that generalisation is not a process of mere naming, it is also a process of inference, his statement cannot be controverted, though his meaning of the word inference

is different from that which I should attach to it. But the error that he seems to me to fall into is in the nature of the general truth that is reached. He says that, from the observation of the mortality of John and Thomas and of all others we ever heard of in whose case the experiment had been fairly tried, we reach the general inference that all men are mortal. I submit that we do nothing of the kind, or that if we do so we exceed our warrant; we commit the fallacy, which has no place among the fallacies of logicians, but which is well known to practical people under the title of "jumping to a conclusion." What we observe in the cases of John and Thomas, and others, is a relation between each man and mortality, and the general conclusion, which alone we are justified in drawing from these observations, is not that all men are mortal, for which we have no warrant, since the death of all men has not been observed, but that *in our experience the relation between man and mortality is constant;* and it is from this general relation, and not from the relation, All men are mortal, that we draw our inference that the Duke of Wellington is mortal. The inference is the immediate inference that the relation between the Duke of Wellington and mortality *is like* the relation between all other men in whom the experiment has been fairly tried and mortality; and the ground or warrant for the inference is that this latter relation has been found constant in experience. That the constancy in experience of the relation is the condition that warrants our inference is shown by the failure of the warranty when the condition is withdrawn. For why is the inference that A. B. has ten fingers not of equal validity with the inference that he is mortal? Wholly and solely because the relation between men and ten-fingeredness is not equally constant in experience with the relation between men and mortality. So far from inferring that Socrates is mortal, because all men are mortal, the very reverse is the case. We cannot infer that all men are mortal until we have determined that Socrates is mortal.

It is not denied that we may, from the constancy of the relation in experience, as justly draw the conclusion that all men are mortal as that the Duke of Wellington is mortal. What is denied is that it is necessary to draw the first inference as a step towards the formation of the second. The inference that the relation between all men and mortality is like the relation, which has been found constant in experience, between very many men and mortality, is exactly on a par with the inference that the relation between this particular man and mortality

is like the relation, constant in experience, between very many men and mortality, and it is no more necessary to pass through the relation, All men are mortal, in order to reach the conclusion, The Duke of Wellington is mortal, than it is necessary to pass through Berlin in going from London to Paris. How nearly Mill reaches this conclusion, and how completely he misses it, is seen from the last portion of the quotation that has been made from him. "When therefore we conclude, from the death of John and Thomas and every other person we ever heard of in whose case the experiment had been fairly tried, that the Duke of Wellington is mortal like the rest, we may indeed pass through the generalisation, All men are mortal, as an intermediate stage; but it is not in the latter half of the process, the descent from all men to the Duke of Wellington, that the *inference* resides. The inference is finished when we have asserted," says Mill, "that all men are mortal." The inference is finished, in my view, when we have asserted that the relation between the Duke of Wellington and mortality is like the relation, found constant in experience, between many other men and mortality, and any reference to the mortality of all men is, with reference to the mortality of the Duke, superfluous verbiage.

On a still later page, Mill makes a still closer approximation to the form in which I contend that this case of reasoning should be cast. "The inquirer who has logically satisfied himself that the conditions of legitimate induction were realised in the cases *A*, *B*, *C* would be as much justified in concluding directly to the Duke of Wellington as in concluding to all men. The general conclusion is never legitimate unless the particular one would be so too; and in no sense intelligible to me can the particular conclusion be said to be drawn from the general one." This is exactly the position that is here taken, with this addendum, that what Mill implies by the logical satisfaction that the conditions of legitimate induction were realised in the cases *A*, *B*, *C* I take to be the experience that, in *A*, *B*, *C*, and the rest of the alphabet, the relation is found in experience to be constant. But if this is so, and if, when the legitimate induction with regard to *A*, *B*, *C*, etc., has been made, we are as much justified in concluding directly to the Duke of Wellington as in concluding to all men, what becomes of Mill's argument that the inference is finished when it is said that All men are mortal? The statement that All men are mortal is not the same as the statement that The Duke of Wellington

is mortal, and Mill himself admits that the latter statement may be actually and *bonâ fide* a new truth not immediately apparent to the man who is cognisant of the former. It seems evident that in this passage Mill makes the admission implicitly, which he does not recognise explicitly, that the actual process of inference is, as has been stated, the relation of this *A* to *B* (or of all *A's* to *B*) is like the relation of *A's* to *B*, which has been found in experience to be constant.

It is the more remarkable that Mill should have considered that the generalisation, derived from our experience of the mortality of individual men, must take the form, All men are mortal, since, a few pages further on, he actually states a close approximation to what I believe to be the true doctrine of that form of reasoning which is usually supposed to be expressed in the syllogism. "In the argument," he says, "which proves that Socrates is mortal, one indispensable part of the premises will be as follows: 'My father, my father's father, A., B., C., and an indefinite number of other persons, were mortal.' . . . This is the major premise divested of the *petitio principii*, and cut down to as much as is really known by direct evidence." This is not, in my opinion, the whole of the major premisses, for it would be insufficient if, although it were absolutely true, there were in our experience any cases of immortality. The true major premiss is, as has been stated, "The relation between man and mortality is constant in experience." Mill then goes on to say, "In order to connect this proposition with the conclusion, Socrates is mortal, the additional link necessary is such a proposition as the following: 'Socrates resembles my father, and my father's father, and the other individuals specified.' This proposition we assert when we say that Socrates is a man. By saying so we likewise assert in what respect he resembles them, namely, in the attributes connoted by the word man. And we conclude that he further resembles them in the attribute mortality." This, with the substitution of the major premiss suggested for that proposed by Mill, is precisely the nature, as I conceive it, of the argument which is supposed to be syllogistic. It may be expressed as Mill here expresses it, or it may be cast into any of the following forms: Since Socrates resembles men who have died, in all respects, save one, in which they have all resembled one another, therefore he will resemble them in this one respect also; or, the same relation, which has been found constant in experience, between innumerable men and mortality

will be found to exist between this man and mortality; or, the relation between this *a* and this *b* is like the relation, which has been found constant in experience, between *A's* and *B's;* or *a* : *b* is like *A's* : *B's* (constant in experience). As our warrant for assimilating these relations is the likeness of their first terms, the whole process should be expressed—

$$\begin{array}{rcl} & A's : B's & \\ & \vdots & \\ \text{is like} & a : b, & \end{array}$$

or, since *a* is like *A's* which have in experience a constant relation to *B's*, therefore *a* also stands in this relation to *b*.

But these are precisely the formulæ by which, as we shall presently find, immediate inference is expressed, so that we are driven to the inescapable conclusion that this example of the syllogism is a process not of mediate, but of immediate inference, and is precisely the same in nature as the process whereby we infer that a resisting body possesses extension.

Although it is the same in nature, it is, however, not the same in form, and in order to display completely the whole form of the process it will be necessary to trace its relations with other forms of immediate inference. An inkling of these relations was discerned by Mill, who compares, in a very noteworthy passage, the fundamental principle of the syllogism with the axioms of mathematics.

"If we generalise the process," he says, "and look out for the principle or law involved in every such inference, and presupposed in every syllogism, the propositions of which are anything more than merely verbal, we find not the unmeaning *dictum de omni et nullo*, but a fundamental principle, or rather two principles, strikingly resembling the axioms of mathematics. The first, which is the principle of affirmative syllogisms, is that things which coexist with the same thing coexist with one another, or (still more precisely) a thing which coexists with another thing, which other coexists with a third thing, also coexists with that third thing. The second is the principle of negative syllogisms, and is to this effect: that a thing which coexists with another thing, with which other a third thing does not coexist, is not coexistent with that third thing."

It is one of the most curious anomalies of human faculty, that Mill should have attributed to the syllogism the establishment of relations of coexistence and non-coexistence, with which it has nothing at all to do; and not only that his intellect, acute as it was, should have

fallen into this error, but that, powerful as it was, it should, after clearing the chasm which separates the syllogism from the axioms of mathematics, have baulked at the ditch which separates these from other forms of axiomatic reasoning.

That the form of the syllogism has been employed to establish relations of coexistence and non-coexistence is not denied; but that it can be so employed, and still remain a syllogism in the sense in which logicians use the term, appears altogether erroneous. The *dictum de omni et nullo*, which was unmeaning to Mill, but which sufficed for many hundreds of years as a definition of the meaning of the syllogism, expressly affirms the nature of the relations with which the syllogism deals, and these relations are not relations of coexistence and non-coexistence, but of inclusion and exclusion. "Whatever is predicated of a term distributed, whether affirmatively or negatively, may be predicated in like manner of anything contained under it." That is to say, whatever may be predicated of every member of a class may be predicated of any member of that class. "It is the nature of Universals," says Professor Seth, "which forms the central theme of scholastic debate." Were further evidence needed, it would be found in the complicated arrangement of moods into which the forms of the syllogism have been divided—an arrangement which, in so far as it does not depend upon the affirmation or denial of a relation, depends entirely upon the universality or particularity of the propositions, that is to say, upon the total or partial inclusion or exclusion of the respective terms in or from each other. It is true that the relations are commonly expressed, not *a's* are included or excluded from *b's*, but *a's* are, or are not, *b's*, but it is quite clear, not only from the *dictum* and from the basis of the moods, but from the universal practice of logicians; from the nature of the examples that they furnish; from the distortions that language has had to suffer at their hands in order to translate into aggregates terms that are, on the face of them, homogeneous; from the fact that many logicians, following Euler, have actually illustrated the syllogism by a series of geometrical figures, representing the terms, which are drawn as including or excluding each other, according to the mood of the syllogism; and by the homage which has been paid to the quantification of the predicate, a process which would be meaningless unless the predicated term were an aggregate; from all these indications it is abundantly evident that the terms of the syllogism, save only the subject of the conclusion, are

invariably assumed to be aggregates, and that all three of the relations expressed in the syllogism are invariably assumed to be relations of inclusion and exclusion. When all three terms are singular, and when, therefore, the relations not being relations of inclusion and exclusion, the reasoning is not truly syllogistic at all, the singular terms have always, by a conventional artifice, been feigned to be universal, in order that what is felt to be the true nature of the syllogism may be maintained. Indeed, Keynes has put the question, "Can we formulate a principle which shall be accepted as axiomatic, and which shall apply to syllogisms in other figures than the first?" And this question he has answered by explicitly stating the relations expressed in the syllogism as relations of inclusion and exclusion. "Will not," he says, "the following, which applies immediately to Cesare, be accepted as axiomatic? If one class is excluded from and another is contained in a third class, the second class is excluded from the first." This statement is, from the present point of view, doubly noteworthy, since it not only explicitly recognises the character of the relations dealt with by the syllogism as relations of inclusion and exclusion, but may be taken as implicitly admitting that the reasoning of the syllogism is axiomatic.

The principle, that if one thing coexists with a second, which coexists or does not coexist with a third, then the first coexists or does not coexist with the third, is therefore not the principle that underlies the syllogism. The actual principle that does underlie the syllogism is that if one thing is included in another, which is included in, or excluded from, a third, then the first is included in or excluded from the third. And a comparison of these two principles shows at once that both are but particular cases of a much wider principle, viz. that if one thing bears any definite relation to a second, which does or does not bear the same relation to a third, then the first does or does not bear that relation to the third. Thus if a is equal to b, and b is equal or unequal to c, a is equal or unequal to c. If a is simultaneous with b, and b is simultaneous or non-simultaneous with c, a is simultaneous or non-simultaneous with c. If a is dependent on b, and b is dependent or not dependent on c, a is dependent or not dependent on c. In short, if a stands to b in any definite relation, whether of size or number, or control, or fixation, or supply, or revolution, or time, or place, or any other definite quality whatever, and if b stands in the same, or the negative of the same, relation to c, then a stands

in the same or the negative relation to *c*. Or we may state the principle of axiomatic reasoning thus: If two comparable definite relations have a common term, the relation between them governs the relation between the proper terms; in such wise that, if the relations between the common and respective proper terms are like, the proper terms are related positively; while if the relations between the common and respective proper terms are unlike, the proper terms are related negatively. Or if $a : b$ and $b : c$ represent any definite comparable relations whatever, and are alike, then *a* stands in the same relation to *c* that *a* stands to *b*, and *b* to *c*; or $(a : b)$ is like $(b : c)$ is like $(a : c)$; while if $a : b$ and $b : c$ represent any definite comparable relations whatever, and are unlike; that is to say, if one of them is a negative relation, then *a* stands to *c* in this negative relation; or $(a : c)$ is like either $(a : b)$ or $(b : c)$, whichever is negative. We may for the moment express this principle of axiomatic reasoning briefly by saying that the relation of $(a : b) : (b : c)$ *governs* the relation of $a : c$. It will be noted that the relation of $a : c$ is not necessarily *like* that of $(a : b) : (b : c)$, is indeed like this latter when only the relation $(a : b) : (b : c)$ is a relation of likeness. But it is *governed* by the relation of $(a : b) : (b : c)$ in such wise that when this relation is one of likeness, $a : c$ resembles both of them; and when the relation is one of unlikeness, $a : c$ resembles either $a : b$ or $b : c$, whichever is negative.

If this formula be compared with that already attained as the expression of the reasoning whereby the conclusion was reached that Socrates is mortal, it will be seen that they do not agree. The reasoning of the syllogism conforms to the general case of axiomatic reasoning $(a : b) : (b : c)$ governs $a : c$. The reasoning whereby we ascertained that Socrates is mortal is, $a : b$ is like *A's* : *B's* (constant in experience). What is the meaning of this discrepancy? The meaning is that *the reasoning by which we infer the mortality of Socrates is not a syllogism at all.* It is true that it is cast in the form of a syllogism, but the argument so constructed is not the mode of reasoning which the mind passes through in arriving at the conclusion. It is not from the premisses— All men are mortal, and

Socrates is a man, that we arrive at the conclusion, Therefore Socrates is mortal.

The form is that of the syllogism, no doubt; but then the form in which the reasoning is arbitrarily cast is not the form of the process by

which the conclusion is actually reached. The hands are the hands of Esau, but the voice is the voice of Jacob. It has been shown, and, it is submitted, shown beyond reasonable doubt, that the major premiss of this seeming syllogism does not in fact enter into the reasoning at all, and has no part in the process by which the conclusion is reached. The process is: The relation of Socrates to mortality is like the relation of other men to mortality. There is no intervention of a major premiss. The conclusion is not governed by the relation between the premisses. There is no true syllogism. Compare this with a true case of syllogistic reasoning, and note the difference. I am told that there has been an earthquake at Selangor, and on making inquiries as to that locality I am told by one authority that it is in South America, and by another that it is in Asia. Desiring to know in which of these continents the earthquake has occurred, I consult a gazetteer, and find that Selangor is in Malacca. At once, by a true syllogism, I conclude that it is in Asia. The process of reasoning is:—

Selangor is included in Malacca;
Malacca is included in Asia;
Therefore Selangor is included in Asia.

Observe that in this reasoning there is, in the first place, no *petitio principii*. The conclusion is, of course, contained in the premisses; but it is not, as in the case of Socrates, contained in the major premiss alone. The conclusion is not a mere repetition of part of the major premiss, it is a real addition to my knowledge. In the second place, it is to be noted that there is no direct inference from a single relation, constant in experience, to the conclusion. The conclusion is reached by a comparison of the premisses, both of which are necessary to its formation. It is not possible in this case, as in the case of Socrates, to reach the conclusion by abandoning the major premiss and substituting for it the constancy in experience of the relation between Asia and all the towns resembling Selangor; for no such relation has ever been experienced. We infer that Selangor is included in Asia by assimilating this relation to the relations expressed by the premisses, and in no other way can the conclusion be reached from the knowledge at our command. The form of the reasoning is not $a : b$ is like $A's : B's$ constant in experience, but $(a : b) : (b : c)$ governs $a : c$.

It appears, therefore, that the whole difficulty with respect to the *petitio principii*, which is alleged to be inherent in every syllogism, is due, not so much to a misapprehension of the nature of the syllogism

as to a misapprehension of the form of reasoning in what has been erroneously taken for the classical example of the syllogism. The complaint, that every syllogism is vitiated by an inherent *petitio principii*, is founded upon the analysis of an argument which is not a syllogism at all. It is like the complaint about the badness of the tea. "No," said the responsible officer, "no, I admit that it is not good tea; but it is very passable coffee." Considered as a syllogism, the argument for the mortality of Socrates is not a satisfactory form of reasoning; but as a case of simple immediate inference, it is irrefragable.

The syllogism is not, then, a case of Immediate Inference. Neither is it a case of Mediate Inference in the sense in which this term is used in a subsequent section. It is a process of reasoning, no doubt, and as such it must, if the contention of this section is true, be a process of comparison and assimilation of relations. We have already seen that it is reached by means of a comparison of the relations $a : b$ and $b : c$, but we have still to show that the comparison and assimilation of relations, with, of course, the incidental discrimination of difference, is the sole process employed in reaching the conclusion.

In Immediate Inference, the relation $a : b$ is assimilated to the relation $A : B$ through the assimilation of the term a of the one to the term A of the other. The form of the reasoning is: Since a is like A, therefore $a : b$ is like $A : B$. Axiomatic reasoning is a degree more complex, since in it we do not assimilate or argue from the terms. We are concerned with relations only, and do not consider whether the terms are like or unlike.

The first step in axiomatic reasoning is to discern between two relations a sufficient degree of likeness to render them comparable. If $a : b$ is a relation of, say, coexistence, and $b : c$ a relation of, say, position in space, no reasoning process can begin. There must first be a basis of comparability, that is to say, of likeness in order, between the two relations. If this assimilation can be effected; if the relations are discerned to be of the same order; if both are relations of coexistence, or one of coexistence and the other of non-coexistence; if the relations predicated are the same positive relations, or the positive and negative of the same relation—then it is immediately discerned that there is a relation of like order between a and c. The process of reasoning is $(a : b)$ is like $(b : c)$ is like $(a : c)$. If the likeness of $a : b$ to $b : c$ extends no further than comparability; if they are like

enough for comparison only, and on comparison are unlike in sign, then this indefinite and incomplete likeness is mirrored in the similar indefinite and incomplete likeness of $a : c$ to both. To the positive relation it is like only in being a relation of the same order—only sufficiently to be comparable. To the negative relation it has a closer likeness, and one that verbally, but verbally only, is complete. The likeness of negative relations is at best a very indefinite and remote likeness. If a is included in b, and c is included in d, the likeness of $a : b$ to $c : d$ is definite and complete. But if a is not included in b and c is not included in d, the likeness of $a : b$ to $c : d$ is remote and indefinite. All the likeness that can be predicated of them is that they are comparable. They both refer to the same order of relation; and this is all the likeness that can be inferred between $a : b$ and $b : c$ on the one hand and $a : c$ on the other, when $a : b$ and $b : c$ are relations of the same order, but not of the same sign. Thus far, however, the inference extends. $a : b$ and $b : c$ are compared, and whatever likeness is traceable between them is predicable of $a : c$. If there is, between the former, likeness in the order of the relation, then this likeness extends to the latter also. Just so much likeness and no more as is discernible between the first two is inferrible between the last and them. When, therefore, the first two are not only of the same order, but present as well the much closer likeness of positive relations, the same likeness that exists between them is inferred to exist between the third and them. Thus axiomatic, like every other form of reasoning, is a comparison and assimilation of relations. $a : b$ and $b : c$ are first assimilated to the extent of being brought into comparable form. They are then compared, and further assimilated or discriminated. In either case $a : c$ is assimilated to them as far as assimilation is possible. If they are alike positive, it is assimilated completely; if they are unlike in sign, but like in order, it is assimilated as to order only; if they are of different orders, or if, being of the same order, they are both negative, there is not sufficient basis of definite likeness between them to found an inference upon, and no inference is effected.

If this be the nature of axiomatic reasoning, and therefore of the syllogism, the question presents itself, What light does this exposition throw upon the principle that underlies the syllogism, and that gives to the syllogism its validity?

That there is a principle underlying the syllogism all authorities are agreed. Aristotle considered that this principle was the celebrated

dictum de omni et nullo of which he was the discoverer; but this, although it maintained its authority unimpaired for many centuries, has failed to satisfy subsequent investigators, and Mill even calls it meaningless. Sir W. Hamilton expresses the principle as, "What worse relation of subject and predicate subsists between either of two terms and a common third term, with which both are related, and one at least positively so—that relation subsists between these two terms themselves." This statement is of great interest, since it explicitly recognises that the syllogism is a comparison and assimilation of relations; but its cumbrous form alone is enough to make us suspect that it is not the true, or at any rate not the best, expression of the principle underlying the syllogism; and its fatal defect is that it is as much in need of a warrant as is the syllogism itself. It has never been adopted, as far as I am able to ascertain, by any other authority on the subject. Mill's principle, that whatever has a mark has what it is a mark of, has indeed the merit of simplicity, and bears some resemblance to a former suggestion of Hamilton's, that what is part of a part is part of a whole; but it has been neglected, and as I think deservedly, for if the dictum of Aristotle is meaningless, a dictum which so nearly resembles it both in form and in meaning is scarcely likely to commend itself to those to whom the former is unacceptable.

Through all these varieties of the principle which is supposed to underlie the syllogism, it is noteworthy that all thinkers are agreed upon the main point, viz. that there *is* a principle underlying the syllogism, that is to say, that the syllogism is not self-evidently valid, but requires the support of some deeper, wider, more general, more evidently necessary, more fundamental principle — that there is a principle with which every syllogism must conform, and upon whose truth that of the conclusion of the syllogism depends. Is there such a principle, and if there be, what is its nature?

It will be seen from the foregoing analysis that the underlying principle, if such it can be called, of the syllogism—the nature of the process that takes place in syllogistic and in all axiomatic reasoning—is the assimilation of relations. And this process of assimilation neither requires nor admits of any validation by reference to a more fundamental principle. The process of comparison is the primary act of thought. The discernment of likeness and difference is the indecomposable element of the thinking process; and when we have reduced the syllogism to the assimilation of relations, we are down

on the bed-rock, and can get no deeper. But if the syllogism is the bare discernment of likeness and discrimination of difference, why does it appear to need the support of any more fundamental principle, since more fundamental principle there cannot be? Why is it not as self-evidently valid as is the process of perception, which also is the assimilation of relations? The reason is that, although axiomatic reasoning is as purely and exclusively the assimilation of relations as is perception, yet it is a more complicated process. In perception, two primary relations are compared and assimilated. In axiomatic reasoning three primary relations are dealt with, and the latter process is as much more complex than the former as the relations between three things are more numerous than the relations between two. It is this complication of the process that has obscured its nature. When $a : b$ and $A : B$ are brought together, the discernment of likeness or unlikeness between them is its own warrant, and needs no invocation of an underlying principle to justify it. But when $a : b$ is compared with $b : c$, and $a : c$ is compared not only with both of them, but with the relation between them, the complication of the process, the number of the relations that are compared, the number of comparisons that are made, obscures the character of the process, and sets us to seek for some other warrant. If, however, the assimilation of relations, with its necessary concomitant of discrimination, is the primary act of thought, and if axiomatic reasoning is reduced to this process, no other warrant is necessary, and the underlying principle of the syllogism is the assimilation of relations.

The canons of the syllogism, and of axiomatic reasoning generally, or the rules which must be observed in order that the reasoning may be valid, will be evident from this examination of its nature.

I. The process is a comparison of two relations for the establishment of a third, and in order that the relations may be compared, they must be comparable; that is to say, they must be sufficiently like in their nature or order, and sufficiently definite in constitution, for comparison. The first canon of axiomatic reasoning is therefore that the given relations must be like in nature. If a is equal to b, and b stands in some relation to c, then, in order that an inference may be drawn with respect to the relation of a to c, the relation of b to c must be one of equality or inequality. If a is equal to b, and b coexists with c; or if a is greater than b and b is less than c; or if a is antecedent to b and b is consequent to c—no inference can be drawn with respect

to the relation of *a* to *c*, for the primary relations are not sufficiently alike to be comparable, and therefore cannot be assimilated either to each other or to the third.

The second canon of axiomatic reasoning is similar to the first. It requires that the primary relations shall be, not merely sufficiently alike to be comparable, but sufficiently definite to be definitely comparable, and to this end one at least of these relations must be positive. It must be, not the mere negation of a relation, but the affirmation of one. If both relations are negative, there is no ground for a definite comparison. There is nothing that can be definitely compared and assimilated; and since none but the vaguest assimilation can be made, none but the vaguest inference can be drawn. If *a* is unequal to *b* and *b* is unequal to *c;* or if *a* is outside *b*, and *b* is outside *c;* or if *a* is non-simultaneous, or non-coexistent, or bears any other negative relation to *b*, and *b* bears the same indefinite relation to *c*—then no definite inference can be drawn with regard to the relation of *a* to *c*. The disregard of this canon, when it occurs in syllogistic reasoning, is called by logicians the fallacy of negative premisses.

The third canon of axiomatic reasoning is that the two given relations must have a common term. If *a* is like *b*, and *d* is like or unlike *c*, no inference with respect to the relation of *a* to *c* can be drawn from these premisses alone. The relation *a* : *b* may indeed be assimilated to, or discriminated from, the relation *d* : *c*, but here, in the absence of further data, the thinking process must end. There is nothing to enable us to establish a relation between *a* and *c*, unless a relation is first given between *b* and *d*. When this canon is disregarded in the construction of the syllogism, the consequent error is the fallacy of four terms; or, if *d* has a verbal resemblance to *b*, if it happens to be called by a similar name, although it is a different thing —then it is the fallacy of the ambiguous middle.

Seeing that the syllogism is but one case of axiomatic reasoning, which is but one of three forms of inference, it will appear manifest that the claim of logicians, that the syllogism is the form in which all our inferences are cast, **the UNIVERSAL PRINCIPLE**, as Whately calls it, of reasoning is unfounded. Indeed, nearly two centuries before Whately, Descartes had explicitly abandoned this claim, and thirty years after Whately, Mill again rejected it; but its nominal abandonment has had little effect upon the teachings of logicians, for Descartes sought for no other principle to include those cases of reasoning which the

syllogism would not cover; Mill still continued to regard it as the form of all deduction; and recent logicians have devoted whole volumes to its exclusive discussion.

An instance of inference which is plainly valid, but which cannot be expressed in the form of a syllogism, is given in *Port Royal Logic*, and has been copied into most later books. It is this:—

The sun is a thing insensible;
The Persians worship the sun;
Therefore The Persians worship a thing insensible.

It seems strange that a process of inference, which fails to include so simple a case as this, should for so long have been considered the type of all reasoning, and stranger still that it should have been so considered by the very men who adduce this exception to its universality. It is plain that the inference is an immediate one, and it will be expedient to see whether it can be expressed in the form in which it is here maintained that all immediate inferences assume. The relation of the Persians to the sun is given as constant in experience, and this is assimilated to the relation of the Persians to an insensible thing; so that the form of the inference is P : S is like P : I. But we have seen that every immediate inference needs a proof, in the shape of a given likeness between one term of the inferred relation and one term of the constant relation. What is the proof in this case? It is twofold. The first term of the given relation is identical with the first term of the inferred relation. The second term of the one is given as identical with the second term of the other. So that the common form of immediate inference

$$\begin{matrix} a : b \\ \vdots \\ a' : b' \end{matrix} \quad \text{becomes in this case} \quad \begin{matrix} a : b \\ : \quad : \\ a' : b', \end{matrix} \quad \text{the double}$$

warrant rendering the conclusion, if not more certain, at any rate more instantly appreciable.

Although we have relegated the syllogism to a very subordinate position among reasoning processes, yet since it is the type, not of all reasoning, but of axiomatic inference, and especially as it has occupied so very large a place in the schemes of logicians down to the present day, it will be well at this point to devote some attention to it, and to see how our estimation of it and its varieties is affected by the new light in which it is regarded.

Syllogisms are divided by logicians into four figures, according to the position of the middle term in the premisses. When this term is the

subject of major premiss and the predicate of the minor, the syllogism is of the first figure; when these positions are reversed it is of the fourth figure; when it is the subject of both premisses, the figure is the third; and when it is the predicate of both, the figure is the second. What is the significance of the position of a term, as subject or predicate of a premiss, logicians have not explained, although they have dealt with its significance in propositions generally; and this omission gives to the division of the syllogism into figures an appearance of arbitrariness and conventionality which is not deserved. If, however, we regard the relation predicated in the syllogism, as, for reasons already given we ought to regard it, as a relation of inclusion, or its negative, exclusion, then the significance of the position of a term in a premiss is immediately apparent. For it is at once manifest that the subject of the premiss is that which is included in or excluded from the predicate, and the predicate is that which includes or excludes the subject. So that the figures of the syllogism, so far from being arbitrary and meaningless groups, are determined by the direction of that relation which it is the function of the syllogism to express. If we designate by an arrow the direction in which the inclusion or its opposite takes place, making it point from the included and towards the including term, the four figures of the syllogism will be as follows:—

1st. *a* is included in *b* which is included in *c*.

2nd. *a* is included in *b* which includes *c*.

3rd. *a* includes *b* which is included in *c*.

4th. *a* includes *b* which includes *c*.

Either of the relations in each figure may be positive or negative, so that both be not negative, which would be a violation of the second canon of axiomatic reasoning; so that each figure is susceptible of three varieties, according as the first relation only, the first and second, or the second only in a positive relation. There are, therefore, on this view, twelve valid moods of the syllogism, as against the twenty-four which logicians usually assign to it.

It will be apparent that when the relation is the negative relation, or

that of exclusion, the direction in which the exclusion takes place is immaterial, for if two things are mutually exclusive, it matters not whether we regard the one as excluding or as excluded by the other; the relation remains the same. We may, therefore, use these relations interchangeably, and the three forms of the first figure will be—

Barbara a's are included in b's which are included in c's
a's are included in c's

Celarent a's are included in b's which are excluded from c's
a's are excluded from c's

a's are excluded from b's which are included in c's
a's are excluded from part of c's

The first form manifestly is that of Barbara and of Darii also, for it makes not the slightest difference to the form of the argument whether the first term is written as *a's* or as some *a's*, and similarly the second form includes not only Celarent, but Ferio.

The third form, which we may if we please call Galero, is not admitted as a valid syllogism except by those logicians who follow Sir W. Hamilton in his quantification of the predicate. Yet it is valid, and when stated in terms of the relations of inclusion and exclusion as in the form given above, it is manifestly valid. For if *a's* are excluded from *b's*, it is an immediate inference that they are excluded from that part of *c's* which is composed of *b's*. If we were to follow the practice of logicians in exhausting possible combinations, we might make a further mood in which the *a's* of the first term were limited to some *a's*, and this mood we might call Galono.

The first mood of the second figure will be—

a's are included in b's which include c's

a form which violates the first canon of axiomatic reasoning, since the given relations are not comparable; hence no conclusion can be drawn in this mood, and it is a well-known logical rule that no affirmative conclusion can be reached in the second figure.

The second mood of the second figure is—

a's are included in b's which exclude c's

and in this case, again, the first canon of axiomatic reasoning is

violated; but here we may exercise the liberty that we have already found that we possess, of transposing the negative relation. The mood will then appear—

$$\left.\begin{matrix} a\text{'s} \end{matrix}\right\} \begin{matrix} \text{are included in } b\text{'s which are excluded from} \\ \text{are excluded from} \end{matrix} \left\{\begin{matrix} \\ c\text{'s} \end{matrix}\right.$$

a form which is at once seen to be identical with Celarent, so that the logical process of conversion to the first figure is, in this case, found to be the transposition of one of the given relations, in order to make it comparable with the other. This mood also includes Festino, for the form—

$$\left.\begin{matrix} \text{some } a\text{'s} \end{matrix}\right\} \begin{matrix} \text{are included in } b\text{'s which are excluded from} \\ \text{are excluded from} \end{matrix} \left\{\begin{matrix} \\ c\text{'s,} \end{matrix}\right.$$

is evidently precisely the same.

The third mood of the second figure is—

$$\left.\begin{matrix} a\text{'s} \end{matrix}\right\} \text{are excluded from } b\text{'s which include} \left\{\begin{matrix} \\ c\text{'s,} \end{matrix}\right.$$

which can be converted by transposition of the negative relation to—

$$\left.\begin{matrix} a\text{'s} \end{matrix}\right\} \begin{matrix} \text{exclude } b\text{'s which include} \\ \text{exclude} \end{matrix} \left\{\begin{matrix} \\ c\text{'s,} \end{matrix}\right.$$

a form which includes Camestres and its limited form Baroko.

In the third figure the middle term is included, not only, as in the first figure, in the third term, but in the first term also, so that the first mood of this figure will be—

$$\left.\begin{matrix} a\text{'s} \end{matrix}\right\} \text{include } b\text{'s which are included in} \left\{\begin{matrix} \\ c\text{'s.} \end{matrix}\right.$$

In this case the relations are not comparable, so that as the case stands no conclusion can be drawn. But it is possible to assimilate the relations so that they become comparable. For if *a's* include *b's*, then *b's* must include part of *a's*, and, substituting this for the minor premise in Darapti, we get—

$$\left.\begin{matrix} \text{some } a\text{'s} \end{matrix}\right\} \begin{matrix} \text{are included in } b\text{'s which are included in} \\ \text{are included in} \end{matrix} \left\{\begin{matrix} \\ c\text{'s,} \end{matrix}\right.$$

which is identical with Darii and with Barbara. It is evident we could,

if we choose, assimilate the relations by transposing, not the minor, but the major premise, converting the mood into—

$$\begin{matrix} & \text{include } b\text{'s which include} & \\ a\text{'s} & \text{include} & \text{some } c\text{'s,} \end{matrix}$$

which is a syllogism in Bramantip.

The second mood in the third figure is that in which the major premise is negative, or—

$$\begin{matrix} & \text{include } b\text{'s which are excluded from} & \\ a\text{'s} & \text{(or exclude)} & c\text{'s,} \end{matrix}$$

from which we can conclude that part of a's at any rate exclude c's. This is Felapton in the third and Fesapo in the fourth figure.

The third mood in the third figure is—

$$\begin{matrix} & \text{exclude} & \\ a\text{'s (are excluded from) } b\text{'s which are included in} & & c\text{'s,} \\ & \text{are excluded from part of} & \end{matrix}$$

which is identical with the unacknowledged mood Galero in the first figure.

So far we have accounted for two only of the six moods included by logicians in the third figure, and we are confronted with the question, What is the position of the other four, and how is it that they are as yet unaccounted for? The answer is that they are minor variations dependent on the limitation of the aggregates of which the terms are composed, and readily fall into forms already given when these limitations are imposed.

Thus, Datisi is in the form—

$$\begin{matrix} & \text{include some } b\text{'s which are included in} & \\ a\text{'s} & & c\text{'s,} \end{matrix}$$

which, by transposition of the minor, to render the relations comparable, becomes—

$$\begin{matrix} & \text{are included in } b\text{'s which are included in} & \\ \text{some } a\text{'s} & \text{are included in} & c\text{'s,} \end{matrix}$$

which is the same as Darii, Barbara, and Darapti.

Disamis is—

$$\begin{matrix} & \text{include } b\text{'s some of which are included in} & \\ a\text{'s} & & c\text{'s.} \end{matrix}$$

and similarly rendering the relations comparable by transposing the major, we get—

$$\begin{matrix} a\text{'s} & \text{include } b\text{'s, which include} \\ & \text{include} \qquad\qquad \text{some } c\text{'s,} \end{matrix}$$

a syllogism in Bramantip. In order to reduce it to Disamis the conclusion has to be converted into some *a's* are included in *c's*. This and the other limited forms of the third figure are never used in actual reasoning. They are mere logical curiosities, and do not demand further notice.

The fourth figure, which is in such disfavour with logicians, and which was not even allowed by Aristotle, is seen, when expressed in terms of relations of inclusion and exclusion, to be, not only a valid, but a useful and common form of reasoning. In this figure the middle term includes the third, and is included in the first; precisely the reverse of the first figure, and the resulting syllogism is one in which all the processes of the first are reversed, including the conclusion.

The form of Barbara we have seen to be—

$$\begin{matrix} a\text{'s} & \text{are included in } b\text{'s which are included in} \\ & \text{are included in} \qquad\qquad c\text{'s.} \end{matrix}$$

The form of Bramantip is—

$$\begin{matrix} a\text{'s} & \text{include } b\text{'s which include} \\ & \text{include} \qquad\qquad c\text{'s,} \end{matrix}$$

an argument which needs no conversion of its terms to facilitate the comparison of the relations between them.

The second form—

$$\begin{matrix} a\text{'s} & \text{include } b\text{'s which exclude} \\ & \text{exclude} \qquad\qquad c\text{'s,} \end{matrix}$$

is Fesapo, and is the same as Felapton in the third figure.

The third mood is—

$$\begin{matrix} a\text{'s} & \text{exclude } b\text{'s which include} \\ & \text{exclude} \qquad\qquad c\text{'s,} \end{matrix}$$

which is Camenes, and is identical with Camestres and Baroko.

The moods Dimaris and Fresison are left unaccounted for.

The form of Dimaris is—

$$\begin{matrix} a\text{'s} & \text{include} & b\text{'s} & \text{some of which include} \\ & & & \text{include} \end{matrix} \quad c\text{'s},$$

a conclusion which may obviously be transposed to "some *a's* are included in *c's*"; while Fresison is—

$$\begin{matrix} \text{some } a\text{'s} & \text{include} & b\text{'s} & \text{which exclude} \\ & & & \text{exclude} \end{matrix} \quad c\text{'s},$$

which is manifestly identical with Fesapo.

That the explicit recognition, in the form of the syllogism itself, of the relations of inclusion and exclusion which the *dictum de omni et nullo* attributes to it, is a real and not merely a verbal improvement in its construction, may be shown by exhibiting its effects in a concrete case. Taking as an example the instance of Bramantip adduced by Jevons, we find that in the accepted mode it is in the following form:—

All metals are material substances;
All material substances are gravitating bodies;
Therefore Some gravitating bodies are metals.

Translated into terms of inclusion and exclusion this becomes—

Material substances include metals;
Gravitating bodies include material substances,
Therefore Gravitating bodies include metals.

It may be objected that this is not the same syllogism, but a syllogism in Barbara into which that in Bramantip has been converted; and this may or may not be admitted according as we do or do not regard the copula as an essential part of a proposition. So to regard it seems, in view of the relation which is admittedly expressed by the syllogism, a pedantic adherence to an arbitrary form. So long as the same relations among the terms are maintained, the retention of them in the same position in the proposition as subject or predicate seems the merest pedantry. Even if it be admitted that the syllogism has been converted from Bramantip to Barbara, it will appear that this method of conversion is superior to that formulated by the rules of logic, for it certainly displays more clearly the nature of the conclusion reached.

FAULTS OF AXIOMATIC REASONING: FALLACIES

Axiomatic reasoning, as it is by no means the only form of reasoning, so it is by no means the only form which can be conducted fallaciously; but the term Fallacy has been so long connected with the syllogism that it is preserved in this connection. Of the fallacies commonly enumerated by logicians, a small proportion only are breaches of syllogistic reasoning. The remainder, the material fallacies, cannot be reduced to violations of the rules of the syllogism, and this fact ought, one would think, to have raised a suspicion that the syllogism is not the only form of reasoning. An incidental advantage of expressing the syllogism in terms of relations of inclusion and exclusion is the ease and certainty with which this expression exposes both the presence and the exact nature of a logical fallacy—of a fallacy *in dictione*.

We may take as an example a fallacy instanced by Jevons—

All avaricious men refuse money;
This man refuses money;
Therefore This man is avaricious.

This is the first mood of the second figure.

$$a \text{ is included in } b\text{'s which include } c\text{'s},$$

and since the relations are not comparable, no conclusion can be drawn. In logic, the fallacy is that of the undistributed middle.

Or take the unacknowledged mood of the first figure—

No turnips are fruits;
All fruits grow on branches;
Therefore No turnips grow on branches.

This includes an illicit major, and therefore, according to logicians, no conclusion at all is inferrible from the premisses; but if it is cast in the form of relations of inclusion and exclusion, an inference is allowable. The argument is—

$$a\text{'s } \begin{matrix}\text{are excluded from } b\text{'s which are included in} \\ \text{are excluded from part of}\end{matrix} c\text{'s}.$$

So that we may infer that some of the things that grow on branches are not turnips, or that other things than turnips grow on branches. It

does not, however, allow us to infer whether turnips do or do not so grow. Another case of the same fallacy is given by Jevons: A science which furnishes the mind with a multitude of useful facts deserves cultivation; but logic is not such a science; therefore logic does not deserve cultivation. Jevons calls this an apparent syllogism, and declares that no conclusion can be drawn from the premisses, but it is evident that this is not the case. We can draw the conclusion that logic is excluded from a part of the sciences that deserve cultivation, viz. from those sciences which deserve cultivation on the ground that they furnish the mind with a multitude of useful facts.

Among the many anomalies of logical doctrine, and of the practice of logicians, none is more anomalous than the acceptance of the position that the great majority of fallacies are entirely outside the purview of the syllogism, and unexplainable by any breach of its rules, concurrently with the position that the syllogism is the universal form of reasoning. How these two positions could be held simultaneously by the same individuals is one of those mysteries respecting human faculty which justifies the constant reconsideration of first principles, and goes far to excuse the perennial output of works on psychology, though none of them has recognised the need for a reconciliation of these two views.

If, out of seventeen recognised fallacies or breaches of the laws of inference, four only, and these the most obvious and least frequent, can be discovered and identified by applying the rules of the syllogism, how can it possibly be contended that the syllogistic process is the sole process of reasoning? If the unexplained fallacies can be shown to be breaches of the forms of inference that are here displayed, an additional claim for the acceptance of these forms will have been established.

If there are fallacious reasonings which can be correctly expressed in the form of the syllogism without the infraction of any of the rules of that process, surely the conclusion is unavoidable that the rules that they break must be those of some other process of reasoning, or we should be compelled to admit that reasoning may be correctly conducted, and yet fallacious, which is absurd. Nay, more, may we not suspect that if the syllogism is a valid mode of reasoning, and if conclusions reached by it are fallacious, it is because reasonings have been cast in the form of the syllogism that ought not to have been so cast; that it has been used for the establishment of relations other than

those of inclusion and exclusion, and has consequently broken down? It will therefore be expedient to try whether the fallacies can be detected by throwing the argument into the form, not of the syllogism, but of the next more general case of reasoning—the axiomatic. If this does not suffice to indicate the nature of the fallacy, we must test them by the application of some still more general process.

Labour may be saved by first making a distinction between fallacies that actually reside in the process of reasoning and those that are mere verbal quibbles—mere plays upon the different meanings of words. Such are the fallacies of Equivocation, of Amphibology, of Division, of Composition, of the Ambiguous Middle—fallacies that are no doubt a frequent, perhaps the most frequent, source of erroneous conclusions, but that are to be prevented by the more cautious selection of our verbal symbols, not by increased caution in their subsequent use.

It is curious that while, in treating of fallacies, logicians have minutely analysed their nature and have displayed admirable ingenuity and acuteness in determining precisely in what the fallacy consists, they have never given any attention at all to the question, How came this fallacy to exist? How came the reasoner to fall into it? Why should the process of reasoning be conducted incorrectly rather than correctly? What was the temptation, what was the attraction, offered by the fallacious process, which induced the reasoner to follow it rather than to pursue the orthodox path? Surely it is as important to show why a certain conclusion was in fact reached, as to show that it ought not to have been reached. Examination of the syllogism may reveal the latter, but it never can reveal the former, which may, however, be brought into view by regarding the reasoning as an assimilation of relations. Let us examine seriatim the recognised fallacies from this point of view.

1. The fallacy of four terms. That the presence of four terms in a process of immediate inference does not necessarily involve a fallacy has already been shown, and will appear again in a subsequent part of this discussion; and since all thought is a comparison of relations, and since each relation must subsist between at least two terms, it is obvious that even in syllogistic reasoning four terms must necessarily be involved. What is meant, however, is that in axiomatic reasoning there must be no more than three primary terms, and that whatever

terms enter into the relation of which the argument consists, must be either these terms themselves or relations between them. If *a* is like *b*, and *d* is like *c*, no conclusion can be drawn *unless a likeness can be predicated between a and d;* and if there be such a likeness, the reasoning is removed altogether from the category of axiomatic reasoning. To say that there must be three and only three terms in a syllogism is, therefore, to say that the syllogism is a form of axiomatic reasoning.

2. The undistributed middle. This fallacy is best dealt with by examining a concrete case—

All asters are compositæ;
All thistles are compositæ;
Therefore Some thistles are asters.

If we cast this argument into the form of the comparison of relations of inclusion and exclusion, we find that it is in the first mood of the second figure—

a's are included in b's which include c's,

and the relations not being comparable, no conclusion can be drawn. But this explanation, though it shows us that we ought not to have drawn the conclusion that some thistles are asters, does not help us in the least to discover why it is that we do in fact draw this conclusion. If, however, we cast the argument in the more general form of axiomatic reasoning, we at once discover, not only how we came to arrive at the erroneous conclusion, but also that, although we are not justified in drawing this conclusion, yet there is a conclusion which we are justified in inferring from these premisses. To say that All asters are compositæ, and All thistles are compositæ is, indeed, to say that asters are included in compositæ, which also include thistles; but if we discard the syllogism, with its relations of inclusion and exclusion, and look at the propositions from a more comprehensive point of view, we shall see that what is affirmed is—

The relation of asters to compositæ
is like The relation of thistles to compositæ;

or $a : b$
$\therefore$
is like $a' : b$.

And from this assimilation of relations we are as clearly and com-

pletely entitled to draw a conclusion as from any other assimilation of relations. What led us to draw a conclusion from the premisses was the discernment of a likeness in the relations expressed by them. What led us to draw the wrong conclusion was the faulty representation of these relations and the discernment of the wrong likeness—of a likeness that does not exist in place of the one that does exist. When the relations are clearly represented and are discerned to be alike, then it is obvious that we are entitled, and indeed compelled, to draw the conclusion, not that thistles are included in asters, but that thistles are like asters—are like in those characters which enable them to be included among compositæ. And this is, or may be, a true inference. We may never before have noted any similarity between thistles and asters.

3. The ambiguous middle. This is, of course, the fallacy of four terms, and what has been said of this fallacy applies to that.

4. The illicit minor. As an example of this fallacy we may take—

All mammals are warm-blooded;
All mammals are viviparous;
Therefore All warm-blooded animals are viviparous.

In this case, again, there is a manifest resemblance between the relations expressed in the premisses, and this assimilation of the relations warrants the inference of *some* conclusion. The fallacy arises from the fact that, together with the discernment of a similarity in the relations of mammals to warm-blooded animals and to viviparous animals respectively, there is a failure to discriminate the difference between the relation of mammals to viviparous animals and the relation of warm-blooded animals to mammals. It is the two latter relations that should be assimilated to warrant the conclusion, while it is the two former only that can be fully assimilated. Since, however, the two latter relations can be partly assimilated (for if all mammals are warm-blooded, some warm-blooded animals are mammals), the proper terms can be partly assimilated, and we may say that some warm-blooded animals are viviparous. The fallacy arises from the discernment of a likeness, together with the failure to discern an unlikeness. It is the discernment of the likeness which induces us to draw a conclusion; it is the failure to discern the unlikeness which allows us to draw the wrong conclusion.

5. The illicit major.

Conifers are evergreens;
Wheat is not a conifer;
Therefore Wheat is not an evergreen.

a is excluded from b is included in c

Here the manifest unlikeness of the relations predicated in the premisses leads us at once to infer an unlikeness between their proper terms. The fallacy lies in the failure to appreciate that this unlikeness between the relations is not complete. While it is asserted that conifers exclude the whole of wheat, it is not asserted that they include the whole of evergreens; and this want of completeness in the unlikeness between the relations limits the unlikeness that we are warranted in inferring to exist between the terms. All that we are warranted in asserting is that there is an unlikeness between wheat and some evergreens. In this case the fallacy consists in discerning one unlikeness and in failing to discern another. The discernment justifies a conclusion; the failure leads to the wrong conclusion.

6. The fallacy of negative premisses violates the second canon of axiomatic reasoning, and any conclusion reached by assimilating them is, of course, invalid; but seeing that both the premisses are negative, they are alike in that respect; and since we are accustomed to draw inferences from the assimilation of relations, it is not unnatural that we should assimilate two relations of unlikeness, and endeavour to draw a conclusion from them; and, in fact, to say that no conclusion can be drawn from negative premisses is too general a statement. It is true that no syllogistic conclusion can be drawn. No conclusion with regard to the inclusion or exclusion of a and c in or from each other can be drawn from the fact that both are excluded from b, but if we are dealing with the wider relations of likeness and unlikeness, we can, from the unlikeness of both a and c to b, infer that they have a certain similarity to each other. They are alike in being unlike b. It is this discernment of the likeness between the relations expressed in the premisses that causes us to fall into the fallacy. It is the non-recognition of the extremely limited character of the likeness that constitutes the fallacy of the inference, when any likeness between the proper terms is inferred other than their concurrent exclusion from the common term. Doubtless the fallacy of negative premisses is not

a common one, but it is by no means unknown among the varied inferences of practical life. Thus it may be argued that since it is certain that neither John nor Thomas is a negro, therefore they must be alike in being both white men, whereas it happens that John is a Chinaman and Thomas a Malay.

7. The fallacy of the accident, and its converse, the *fallacia a dicto secundum quid ad dictum simpliciter*, are not the mere verbal quibbles that they would appear to be from the instances of them that are commonly adduced. We will not serve up again that piece of raw meat which has remained, as De Morgan says, uncooked for such a prodigious time, but take one of the excellent instances adduced by Mill. The Mercantile Theory "sets out from the common maxim that whatever brings in money enriches; or that everyone is rich in proportion to the quantity of money he obtains. From this it is concluded that the value of any branch of trade, or of the trade of the country altogether, consists in the balance of money it brings in; that any trade which carries more money out of the country than it draws into it is a losing trade; that therefore money should be attracted into the country and kept there, by prohibitions and bounties; and a train of similar corollaries. All for want of reflecting that if the riches of an individual are in proportion to the quantity of money he can command, it is because that is the measure of his power of purchasing money's worth; and is therefore subject to the proviso that he is not debarred from employing his money in such purchases. The premise, therefore, is only true *secundum quid;* but the theory assumes it to be true absolutely, and infers that increase of money is increase of riches, even when produced by means subversive of the condition under which alone money can be riches." The same fallacy is common in tradesmen's circulars. A boiler is advertised to heat so many feet of pipe, or to maintain, at a temperature twenty degrees above the outside air, so many cubic feet of greenhouse contents; and a certificate is adduced from some unimpeachable authority that the feat has actually been performed, and the suggestion is tacitly made that the same boiler will reach the same degree of efficiency in the hands of any purchaser. But these results can be obtained from the boiler *secundum quid* only; that is to say, when it is set by a skilful and experienced workman; when it is fed with the very best coal, hand-picked, and stoked with the utmost care by a skilled fireman thoroughly acquainted with the peculiarities of the boiler; when the wind is steady; when the boiler is free from

incrustation; and subject to many other conditions which are never present together in ordinary everyday working. The premiss, that the boiler has actually performed the work claimed for it, is therefore true *secundum quid* only, and the conclusion that it will be equally efficient in the hands of the customer is a *dictum simpliciter*, which is not warranted. The same fallacy is latent in the prospectus of many a commercial company. A statement of profits made for the last three years is given, and the suggestion is implied that similar profits will be made in the future; or the argument is that since so much profit has been made upon such a capital, a threefold profit will be made upon a threefold capital. But the premisses are true *secundum quid* only. The profit made has been made under certain circumstances—of thriving trade, of open markets, of freedom from competition, of exceptional advantages—and the profit for the future has to be made *simpliciter*, in the absence of these conditions. Trade has fallen off, markets have been lost, competition has been introduced, exceptional advantages have come to an end, and the argument is fallacious. A threefold capital may ensure a threefold output, but the greater output lowers prices, and so diminishes profits. Again, the fallacy is in arguing *a dicto secundum quid ad dictum simpliciter.*

8. The position of the Ignoratio Elenchi among fallacies is a peculiar one. It is a fallacy, not in the construction of an argument, but in the refutation of one. It is an error, not in the primary assimilation or discrimination of relations, but in the assertion that they have been wrongly assimilated or discriminated; but it is very rarely that the term is restricted to this, its true logical meaning. It is most commonly used to cover an assertion that, apart altogether from the argument by which the conclusion is established, the conclusion ought to be rejected on grounds that have nothing to do with this argument; nay, more, it is frequently used as an appellation for the process which is otherwise known as "drawing a red herring across the path," "going off on another scent," or "starting another hare." It is applied to the favourite device of the controversialist who has a bad case—attributing to the adversary opinions that he does not hold, and traversing these instead of meeting the case that he does advance. This is the standing fallacy of the political world, and is practically the sole method of political argument.

Of *ignoratio elenchi* Jevons says it is difficult to adduce concrete examples, but the following is an illustration of the fallacy in its

restricted sense. If a man were to sue another for debt, for goods sold and delivered, and the debtor were to reply that a man was not bound to pay for what he had bought, he would be erroneously asserting that the argument was false on which his indebtedness was founded. But if he asserted that he was not bound to pay the plaintiff because the plaintiff himself did not pay his own debts, he would dispute the conclusion upon grounds which have nothing to do with the argument upon which it is founded, and would perpetrate an *ignoratio elenchi* in the more ordinary use of the term. The commonest form of the *ignoratio elenchi* is, in fact, this very kind of assertion, which may be generalised in the expression, "You're another." A minister, whose conduct of affairs is criticised, rarely attempts to show that his conduct has been justifiable. He limits his reply to the assertion that his critic or the colleagues of his critic, when in office, had acted in the same way; and absurd as is the argument, if argument it can be called, it seldom fails to carry to the assembled legislators the conviction that the attack is baseless—so small is the logical capacity necessary to carry on the affairs of a nation. If the answer is not a bald *tu quoque*, it usually takes the form that the criticism is brought forward too soon or too late, or in the wrong form, or by the wrong person, or some other instance of the *ignoratio elenchi*. A minister is accused of unseemly conduct in holding shares in a company which does business with the Government. He replies that he has not influenced the contracts given to the company. The answer is *ignoratio elenchi*. It is asserted that the grievances of certain British subjects resident in a foreign country are not grave enough to justify a war on their behalf; it is *ignoratio elenchi* to reply that their oppressors are both ignorant and dirty. When it was argued that the claims of Don Pacifico, of £150 for a bedstead, £30 for a pair of sheets, £10 for a pillow-case, etc., were excessive and fraudulent, it was *ignoratio elenchi* in Lord Palmerston to asseverate that an English subject, however lowly and pitiful, ought to receive the protection of the English Government against the tyranny of a foreign nation; that, "as the Roman in days of old held himself free from indignity when he could say 'Civis Romanus sum,' so also a British subject, in whatever land he may be, shall feel confident that the watchful eye and the strong arm of England will protect him against injustice and wrong." He might as well have introduced into the discussion the birds and the blossoms of spring, which, equally, had nothing to do with the case;

and it is in the introduction of a question foreign to the real question at issue that *ignoratio elenchi* consists. A series of excellent examples of the fallacy appears in Beatrix Esmond's defence against the charge of indiscretion in her conduct with the Pretender. She attacks her accusers one after another. Again and again she tries to exasperate them by her waspish tongue into a diversion of the conversation to some other topic. It is to prevent the perpetration of this fallacy that that august official, the Speaker, presides over the proceedings of the greatest deliberative assembly in the world, and calls to order those speakers who wander from the question under consideration. Up to the present time the task has been beyond his power.

9. The peculiar position of the syllogism to the *petitio principii* has already been dealt with. All that remains here to add with regard to the *petitio principii* is that De Morgan was undoubtedly right in supposing that by this expression the Schoolmen intended to be understood the begging of the *principium*—of the major premiss—only. It was used to designate the assumption of a major premiss invented for the purpose of the argument, and not included among the recognised *principia* which predicated of things their essences. Its appropriate application would therefore be to an argument in which the major premiss is assumed for the purpose of that particular argument, but it is commonly applied to an enthymeme in which the sole premiss is identical with the conclusion. As the suppressed premiss in an enthymeme is usually the major, the common fallacy which is called the *petitio principii*, and which must consist in the begging of the minor, is not correctly named. In practice, however, the distinction is not easily made and is not important. It is evident that it matters little whether we say, "You must have injured yourself in that race, for it is always injurious to run as fast you ran," or, "You must have injured yourself, for you ran too fast." In the first the minor is suppressed and the major begged, in the second the major is suppressed and the minor begged. In either case the argument amounts to this: "You must have injured yourself, for you ran so fast as to injure yourself."

Instead of the avowed, it may be the suppressed premiss which is begged, and whether it is the major or the minor which is both suppressed and begged, the fallacy is very common. "He is justly punished, for what punishment can be too severe for a man who thrashes his aged mother?" This is an enthymeme in which the minor premiss, that the man is guilty, is suppressed and begged. "You

cannot say that the war is unjust, for it is always just to fight in defence of our rights." "How can you call him an honest man? Is not stealing ideas as bad as stealing money?" These and similar arguments are begging of a suppressed minor.

Begging of the suppressed major is often called "jumping to a conclusion," and is a very commonly perpetrated fallacy. "I see that the Robinsons have returned to town," says a lady. "Are you sure of that?" "Oh yes, their blinds are up." Here the major premiss, that the only occasion for drawing up the blinds is the return of the family to town, is begged. "So John and Mary are engaged!" "How can you say so?" "Well, Jane told me that she had seen them walking in the lane together." "His red nose proclaims him a toper." "Lost your purse, have you? That comes of cutting your nails on a Friday." "No wonder you broke your arm, after sitting down thirteen to dinner." All these are examples of the fallacy of jumping to a conclusion, and in all the suppressed major is begged.

There is a subtle form of argument in which both premisses are suppressed, as in the case in which Talleyrand is said to have retorted upon a man who was boasting of the beauty of his own mother, "It was your father, then, who was so ill favoured."

Jumping to a conclusion is the discernment of likeness among relations, unbalanced by the discrimination of difference. It depends on the establishment of an erroneous generalisation, which becomes the major premiss. When the lady concludes that the Robinsons have returned to town, she discerns a likeness between the cases, in which the return of families to town has been indicated by the opening of their houses, and the particular case in question; and she assumes without sufficient warrant that this relation of sequence is constant. And in every case of jumping to a conclusion the error is in assuming an inconstant relation to be constant—in discerning likeness only and neglecting to discriminate difference.

The usual illustrations given of *petitio principii* are those in which the statement contained in the premiss is reasserted in other words, but without other difference, in the conclusion. Such fallacious statements are rather errors of abstraction than errors of reasoning. In them a distinction is made without a difference to justify it. But since all erroneous thinking is erroneous discernment of likeness or erroneous discrimination of unlikeness, it is not to be wondered at that any particular error may be assigned to more than one category. Take the

following example from Weismann: "Then why does it die? My answer to this is simple: because it has lived its time; because its length of life is limited to a period which corresponds with the time necessary for complete reproduction. The physical constitution of the body is so regulated that it remains capable of living until the extrusion of the reproductive cells, and then dies, however favourable external conditions may be for its further support." This is tantamount to saying that the animal dies because it dies, and the difference between this explanation of death and the explanation of the narcotic power of opium in the *virtus dormitiva*, is inappreciable.

10. The *fallacia consequentis* or *non sequitur* bears to an argument precisely the same relation that the *ignoratio elenchi* bears to the refutation of the argument. It is the assertion of the establishment of a relation which has not been established. Thus defined, the *fallacia consequentis* would include every fallacy *in voce*, and every such fallacy is, no doubt, strictly speaking, a *non sequitur*, of which the named fallacies of the undistributed middle, the negative premisses, etc., are but species. The term *non sequitur* is usually reserved, however, for fallacies which cannot be assigned to any definite class, but in which the conclusion is something quite different from anything asserted in the premisses. As, in ordinary reasoning, both premisses are hardly ever stated, the difficulty of assigning any instance of erroneous reasoning to its exact position among fallacies is usually great; and in most cases we have the choice of assigning it to one or another description according to the nature of the premiss that we deem to have been assumed. In the case of the *non sequitur*, in which the reasoning is exceptionally loose and inconsequent, several syllogistic rules may be broken. The following argument is a very common one: When instances have been given of insane persons whose insanity is limited to a small portion of their conduct, some auditor is sure to exclaim, "Well, I suppose everyone is mad upon some point!" Such a conclusion is very puzzling. It is certainly not reached by any process of syllogistic reasoning; it is manifest that the conclusion is in no way justified by the premisses; but yet there does appear to be some sort of connection between them; and the fact that many people, independently of one another, have pursued the same line of thought, shows that the process is a normal one, and is determined by factors that are constant, or at any rate frequent, in the human mind. If we attempt, by supplying a minor premiss, to throw the process of reason-

ing into syllogistic form, it will appear evident that this cannot be the form of thought actually used, for we could only syllogise it somewhat in this form :—

Many insane persons are mad in certain respects only ;
Everyone is an insane person ;
Therefore Everyone is mad in certain respects.

If this be the argument, then, in this case, the fallacy of the *non sequitur* is that of the undistributed middle, combined with that of the illicit major ; and as in addition the minor premiss is manifestly false in fact, there are sufficient reasons for rejecting the conclusion ; and it is absurd to suppose that even the most muddle-headed person could arrive at it by this process. The process by which the conclusion is, in fact, reached is no doubt a direct assimilation of relations. Between the position that "Many persons who are not very mad are mad in certain respects only" and the position that "Persons who are not recognisably mad are mad in certain respects" there is a similarity—a similarity which is not very close, it is true, but which is quite sufficient to enable a muddle-headed person, who is more able to discern likeness than to discriminate difference, to identify them sufficiently to justify in his eyes the inference. It will be found in all cases of *non sequitur* which are bona fide mistakes, and not merely examples of wilful casuistry intended to confuse and mislead, that there is a certain likeness between the relation expressed by the datum and that embodied in the conclusion, a likeness which, superficial and deceptive as it may be, is at any rate sufficiently obvious to mislead the reasoner into effecting an erroneous assimilation, and so falling into the fallacy.

The fallacy of *non causa pro causâ*, or of concluding *post hoc ergo propter hoc*, is confessedly outside the range of explanation by the syllogism. It is a so-called "material" fallacy, a fallacy of the matter with which the syllogism deals, and one with which that mode of reasoning has nothing to do. It is odd that this fallacy, which is certainly a logical fallacy—that is to say, is certainly due to erroneous reasoning—should be unexplainable by reference to that mode of reasoning which is claimed to be the only mode, and should be formally included as a fallacy in the very same logical schemes that make this claim for the syllogism. It would appear that if a mode of reasoning cannot locate a fallacy within its system, so much the worse for the mode ; so much the more are we entitled to argue that

the mode is not the universal mode. If this fallacy cannot be explained by reference to the syllogism, it can nevertheless be explained by reference to another mode of reasoning, and we may leave its consideration until that mode of reasoning has been discussed.

11. Lastly there is the fallacy of many questions, the common device of cross-examining counsel of putting what are in reality several questions in the form of one, and of requiring a single answer to them all. What this fallacy has to do with the syllogism, and how it found its way into books of logic, it is difficult to say. The classical example is: "Yes or no, sir, have you left off beating your mother?" but it is not always put in so brutal a form. The following question, which was actually put to the writer in court, is an equally good example: "Would you yourself have administered this medicine in this case?" To which, if the witness answers "No," he is understood to answer that the medicine was an inappropriate one, whereas his reason for not administering it may well have been that the drug was unfamiliar to him, and that he would not have thought of it; or that there were other drugs of equal appropriateness with whose effects he was more conversant, and which he would therefore have preferred. In this fallacy again the connection with the syllogism is very remote.

We may now take our leave of the syllogism, and of those forms of thought, including axiomatic reasoning and syncrisis, in which the terms of the relation established are regarded as units, and may go on to consider those forms of thought in which the terms of the relation established are themselves explicitly and avowedly relations, and enter as relations into the thought. The general form of the thought is not $A : B$, but $(A : B) : (C : D)$. As we have already seen, these forms of thought may be further divided according to the degree and mode in which the homologous terms are assimilated.

ANALOGY

FORM OF THOUGHT $(A : B) : (C : D)$

The simplest of these remaining forms of thought is that in which the relation $A : B$ is assimilated to the relation $C : D$, but there is no assimilation of A to C or of B to D.

So long as it remains analogy pure and simple, it is the assimilation of the relations alone, and does not involve any assimilation of the homo-

logous terms. But commonly a certain assimilation of these homologous terms, at any rate of one pair of them, is effected, and this assimilation is an illegitimate inference to which the term Analogical Reasoning may perhaps be given.

The following is an instance of analogy as nearly pure as is usually found: "Protestantism," says a Catholic newspaper, "with its odious free discussion of thought, will in time end by completely destroying the nations with which it comes in contact, in the same way that gangrene gradually spreads over every member of the human body." The analogy is an assimilation of the causal relation between Protestantism and the destruction of nations to the causal relation between gangrene and the destruction of human limbs. The two relations are compared, and are declared to be similar, and this assimilation of relations is analogy. There is here no explicit, no avowed comparison of the homologous terms of the two relations—no avowed assimilation of Protestantism to gangrene, nor of nations to human limbs; but, nevertheless, the assimilation of the relations does unavoidably carry with it a certain assimilation of the homologous terms, and there is an implied assertion of likeness between Protestantism and gangrene which serves to transfer to the first some of the loathing with which the second is regarded.

Discarding for the moment this secondary assimilation, which is, however, often the chief purpose for which the primary assimilation or analogy is effected, we have to ask, What is the aim of analogy? What purpose does it serve? It is not a process of inference, and therefore cannot lead us to the discovery of any new relation; but yet it is a frequent and a very useful process of thought. The purposes that it serves are mainly three: It is employed, first, to strengthen the cohesion of a relation; second, to assist the comprehension of a relation; and third, to give to an assertion an emphasis, a quantitative value, which mere assertion fails to convey.

If the cohesion of a relation is not very strong, it may be strengthened by assimilating it to a relation that is more strongly coherent. This is the purpose for which analogy is employed in the instance given above. The credibility of the causal relation between Protestantism and the destruction of nations is, *primâ facie*, not very high; the cohesion of the relation is not very strong. If it can be assimilated to a causal relation of great cohesion, its credibility is increased. The causal relation between gangrene and the destruction of limbs is

one of these strongly coherent relations; and the assimilation to it of the alleged destructive influence of Protestantism will, if it can be effected, increase the cohesion of the latter relation. It is true that the assimilation is a mere assertion, that there is no process of inference—no common intermediate similarity to lead to and confirm it; but this defect is glossed over by insisting upon the cohesion of the assimilated relation, upon the certainty with which destruction follows gangrene, and upon the horrible nature of the process. Attention is diverted from the absence of proof by concentrating it upon other features in the thought.

The second purpose for which analogy is employed is to render clear a complex relation by assimilating it to a simpler one, or what is often the same thing, as far as exposition is concerned, to one that can be stated in simpler terms, or to one that is more familiar. Tell a child or a rustic that the shape of the earth is an oblate spheroid, and he gains little knowledge by the information. Tell him that it is a globe whose polar diameter is less than its equatorial diameter, and he is not much wiser; but tell him that it is the shape of an orange, and the analogy shows him at once what is meant. Explain to a student the relation of different animal forms to one another, by telling him that the monad and its successive offspring have varied at different times, in different directions, at different speeds, to different extents; that the process has been carried on in some lines down to the present day, while the great majority of varied forms have become extinct—and his concept of the relations will be but a confused one. But point out to him the analogy between the divergence of animal forms and the ramification of a tree; bid him observe that competition for food determines the survival and spread of varieties as competition for light determines the direction of growth of the branches—and the relation at once gains in clearness.

The third end for which analogy is employed is to give to an assertion an emphasis, a quantitative value, which in its bare form it does not convey. To say that the bullets fell very thickly carries much less information than to say that they fell like hail. "A large army" arouses a vague thought of number, a number which, while still vague, is indefinitely increased when we are told that the men were as the sands on the seashore for multitude. "A piece of delicate lace" gains in emphasis if it is described as "fine as a cobweb." Similarly, every simile and metaphor, from the imagination of the poet to the

cant and slang of the pothouse, is analogy employed for the purpose of increasing emphasis.

So far we have dealt with pure analogy: but when analogy becomes formal—when the relation is not condensed in a word or a phrase, but is set forth in explicit terms—then the analogy is rarely pure; then what has been termed analogic inference becomes an important feature in the thought.

In the example adduced a page or two back, the mere cohesion of the relation between Protestantism and the destruction of nations could have been strengthened just as well by comparison with any other process of destruction as by comparison with the process of gangrene. It might have been compared with the destruction of sandworks by the rising tide, or with the destruction of a house by fire, or with the destruction of furniture by white ants, or with the destruction of a ship by a storm; but these would not do, and the reason why they would not do is evident. In establishing the analogy, regard is had not only to the assimilation of the relations, but to the assimilation of the homologous terms as well. It is desired not only to establish that nations will be destroyed by Protestantism as limbs are destroyed by gangrene, but also at the same time, under cover of this assimilation, to sneak in an assimilation of Protestantism to gangrene. This secondary use of analogy is often extremely effective, and often outweighs in importance the primary use of the process. "It is quite natural," says Macaulay of one of his victims, "that such a man should speak with contempt of the great reformers of that time because they did not know some of the things which he would never have known but for the salutary effect of their exertions. Just so we have heard a baby, mounted on the shoulders of its father, cry out, 'How much taller am I than papa!'" In this excellent example of analogy the rather complex relation of affected superiority of one man to another, to whom he is in reality inferior, is rendered clearer by its assimilation to a simpler relation of the same kind. So far there is pure analogy; but this is not all. In addition to the asserted likeness between the relations, there is a suggested likeness between their homologous terms. It is suggested, not only that the critic is as greatly inferior to the criticised as a child to a man, but also that the critic himself resembles a child in intelligence.

In thus using the word Analogy in the sense that has just been attached to it, that is to say, as the assimilation of two relations, I am

partly in agreement, partly in disagreement with my predecessors. Although the practice in psychology amounts almost to this, that anybody may call anything by any name that he pleases, yet it does appear desirable that nomenclature should be as uniform as circumstances will allow, and that not only should the sense in which a word is used be defined, but that attention should be drawn to departures from usage. In regarding Analogy as the assimilation of relations, no novelty is introduced into the meaning of the word; this or nearly this, is the meaning which has invariably been attached to it, when the word has been formally defined. But, as so frequently happens, the meaning in use has not always agreed with the defined meaning, or rather, the definition is not sufficiently rigorous to confine the meaning of the word to a single sense. As used here, Analogy means the assimilation of two relations *and nothing more*, and whenever the assimilation is extended so as to embrace not only the relations, but the homologous terms as well, the domain of pure analogy is exceeded and that of inference is entered. But as used by J. S. Mill and other writers, Analogy means an inference—an induction in which the constancy of the major premiss is of low value—and includes, therefore, the assimilation not only of the relations themselves, but of their homologous terms as well. Analogy, in the strict sense in which it has been defined and used in these pages, does not allow of the inference from the known to the previously unknown. It is represented by the formula $A : B$ is like $C : D$, or $\overbrace{\underbrace{A : B}_{:}}^{C : D}$ The relations are compared as wholes and no account is taken of resemblances of their homologous terms. But in analogy as understood by Mill, the formula is $\begin{matrix} A : B \\ : \\ a : b \end{matrix}$ That is to say, the primary assimilation is not of the relations as a whole, but of one pair (A and a) of homologous terms, and from this assimilation is inferred, secondarily, the assimilation of the relations. This is inference, and not analogy at all in my sense. According to the view taken here, analogy is the direct and immediate and primary assimilation of relation. Inference is the indirect, mediate, and secondary assimilation through the medium of a previous assimilation of homologous terms. In Mill's view, the latter, as well as the former, or perhaps the latter alone, is analogy, as is shown both by his defini-

tion, and by the instance which he gives of the argument for the existence of inhabitants of the moon, which has been copied from him by subsequent writers.

"It is on the whole more usual, however," he says, "to extend the name of analogical evidence to arguments from any sort of resemblance, provided they do not amount to a complete induction: without particularly distinguishing resemblance of relations. Analogical reasoning, in this sense, may be reduced to the following formula: Two things resemble each other in one or more respects; a certain proposition is true of the one, therefore it is true of the other. But," he goes on to say, "we have nothing here by which to discriminate analogy from induction, since this type will serve for all reasoning from experience." This is precisely my case. There is nothing to distinguish analogy in this sense from induction, and my contention would be that as it is undesirable to designate the same process by two different titles, and as, if analogy is thus applied, the direct assimilation of two relations is left without a designation; it is surely better to reserve the term analogy to the latter signification, and to leave to induction its proper and sufficient title.

FAULTS OF ANALOGY

Faults of analogy need not detain us long. The power of discerning analogies, one manifestation of the power of discerning similarities, is often deficient to this extent, that analogies which are quickly discerned by one, or many, or the majority of men, are overlooked by others. The ability to discern, in the multitude of relations presented by experience, the particular relation with which we happen to be concerned; or the ability to recall experiences differing in all else, but alike in the particular relation involved; is a matter, partly of abstraction, partly of memory, and partly of generalisation, and will be at fault when these processes are wrongly performed.

Errors of analogy, or the attribution of likeness to relations which are in fact unlike, are common enough, and may be observed in abundance in any political speech, and in the application of proverbs to events experienced.

Lastly, analogy may be used in excess. Likeness of relations may be so readily discerned as to tempt a writer to such frequent excursions from the straight path of his argument that we lose sight altogether of the direction in which he is taking us. He is like a boy who is

constantly quitting his path to run after butterflies. Francis Bacon is a well-recognised instance of the excessive use of analogy. Mill speaks of him as "equally conspicuous in the use and abuse of figurative illustration"; and Macaulay, in his more picturesque and more emphatic way, says that, "In wit, if by wit he meant the power of perceiving analogies between things which appear to have nothing in common, he never had an equal, not even Cowley, not even the author of *Hudibras*. Indeed, he possessed this faculty, or rather it possessed him, to a morbid degree. When he abandoned himself to it without reserve, as he did in the *Sapientia Veterum*, and at the end of the second book of the *De Augmentis*, the feats that he performed were not merely admirable, but portentous, and almost shocking. On these occasions we marvel at him as clowns on a fair day marvel at a juggler, and can hardly help thinking that the devil must be in him." Another character of somewhat different mental calibre, in whom the faculty was almost equally developed, was Sancho Panza.

PROPORTIONAL INFERENCE

FORM OF THOUGHT $(A : B) : (A' : B')$

As just stated, the form of proportional inference is very like that of analogy; but the two are in reality widely different, the difference being that, in analogy, the relations alone are compared and assimilated, no account being taken of the homologous terms; while, in proportional inference, each pair of homologous terms is already assimilated before the process of inference begins; and, until the terms are assimilated, there can be no inference. Each term of the one main relation must be like in nature to the homologous term in the other; and if, as often happens, the terms are compound, then each term in the subsidiary relation must be connate with the homologous term in the subsidiary relation of the other moiety of the thought. In this assimilation of the homologous terms, proportional inference approaches in character to immediate inference, but there is a very substantial difference in the mode of assimilation in the two cases. In immediate inference a term of one relation is assimilated to the homologous term of the other, and this assimilation is the initial stage in the process of thought; but in proportional reasoning the assimilation is no part of the process of thought, indeed it is scarcely correct to say that they are assimilated.

They are alike, but the likeness is given. It is antecedent to the reasoning process; it is not effected during the process, but is already complete before the process begins.

The instance given was that of the comparison between the boiler power required to heat two greenhouses to a certain temperature and that required to heat three similar houses to the same extent. Here it is evident that the thought is the comparison of two ratios—of the ratio of boiler power to work in the one case with the ratio of boiler power to work in the other. If the boiler power is the same in the two cases, then the ratios are seen to be different; if the ratios are the same, then the boiler power must be different in the two cases. And not only is this difference discerned, but it is discerned to be a quantitative difference; and in all cases in which proportional inference is employed, it is employed to establish quantitative ratios. The form of the thought in this case is the comparison of $B : W$ to $B' : W'$, a form which differs from analogy only in the antecedent similarity between the homologous terms B and B', W and W'.

If the temperature to which the three houses are to be maintained is different from that at which the two houses are maintained, then the second term in each relation becomes itself a relation, and the form of the whole thought is a comparison between $B : (V : T)$ and $B' : (V' : T')$, B being the boiler power, V the volume of air to be heated, and T the temperature to be maintained; and further complications may be introduced without in any way altering the main form of the thought, which still remains a comparison of $A : B$ to $A' : B'$ however complicated the A's or B's may become.

None of these terms is subsumed under its homologue, and it is evident, moreover, that the assimilation of the terms is completed before the reasoning process begins, and forms no part of that process.

Suppose that I want to catch a train, and that by a comparison of speeds and distances I discover that I am more likely to catch it by driving a longer distance round by road than by walking a shorter distance across the fields; thus if T, T' be the times, D, D' the distances, and S, S' the speeds of the two journeys, the form of the thought is $\{T : (D : S)\}$ is like $\{T' : (D : S')\}$, or, the relation of the time of travelling to the ratio between the distance and the speed is alike in the two cases; and since $(D : S) > (D' : S')$ it is evident that $T > T'$.

A similar process of reasoning is familiar to every purchaser. This

pair of boots, which costs 15*s.* and will last only six months, is dearer than this other pair, which costs 30*s.* and will last eighteen months. Before I begin to reason out the conclusion, I must have ready to my hand the comparability of price with price, of boots with boots, and of duration with duration; and, the homologous terms being comparable, the ratios are completed and compared. The ratio of price to durability of the one pair is compared with the ratio of price to durability of the other pair, and the one ratio is seen to be greater than the other. Thus $C : C'$, the relative cheapness of the boots, is discerned to depend on the ratio of cost to durability, or $(C : C') : \{(P : D) : P' : D')\}$ which is the same as $\{C : (P : D)\}$ is like $\{C' : (P' : D')\}$, and since $(P : D) > (P' : D')$, $C > C'$.

Two things are noteworthy in connection with the form of thought. In the first place, whatever the nature of the terms, that is to say, whatever the subject-matter of the reasoning, the relation which is established by its means is always a quantitative relation. In the second place, by no artifice can the reasoning by which these quantitative conclusions are reached, be cast in the form of a syllogism.

In view of the claim of the syllogism to be the Universal Principle, or the test of all reasoning, it may be worth while to consider the second point for a moment. If it can be expressed syllogistically, how is it to be done? Are we to infer, for instance, that since all cases of driving by road are quicker than walking across fields, and since this is a case of driving by road, therefore in this case it is quicker to drive by road than to walk across the fields? And if these are not the premisses, what are they? Is the major premiss the proposition that in all cases in which the time consumed in driving by road is less than that consumed in walking across fields, it is quicker to drive by road? If so, then "the *petitio principii* which is inherent in every syllogism" is more than usually apparent. No, modify the proposition as we please, we cannot, by any amount of literary violence, truncate the argument so as to make it fit the Procrustean bed of the syllogism. The reasoning by which I discern that I shall get quicker to the station by the one way than by the other is the direct and immediate comparison of two relations. The reasoning by which I conclude that since Selangor is in Malacca, and Malacca is in Asia, therefore Selangor is in Asia, is the comparison of three relations; and the two processes cannot be reduced to any common process less general than the comparison of relations.

FAULTS OF PROPORTIONAL INFERENCE

In its simpler forms, and when the quantitative relation established is the general relation of the same, or more, or less, proportional reasoning is not very liable to error. If I can travel a hundred miles for a sovereign, there is not much room for error in calculating how much it will cost me to travel two hundred miles under the same conditions. When error does creep into this simple variety of the process, it is usually in postulating like conditions when the conditions are unlike; but then such error would not be in the process of proportional inference itself, but in the previous process by which its data are ascertained. In the more complicated forms error sometimes arises, as every schoolboy knows, from a failure to keep the whole structure of the complicated relations clearly distinguished in the mind, so that some one or other of them gets upon the wrong side of the equation, or is omitted altogether. Error in the result, too, may arise from failure to take account of all the conditions. Thus, it will take twice as much boiler power to heat two greenhouses as to heat one of them, if both are the same size; but this inference is true *cæteris paribus* only. If the one is further from the boiler than the two, or if the one is more draughty, or more exposed to winds, or higher out of the ground, than the two, then the inference will be invalidated. It is true that if I drive nine miles an hour round by the road, I shall get to the station sooner than if I walk four miles an hour across the fields; but if the horse is a jibber, or if the road is blocked by a fallen tree, or is so slippery with ice that the horse has to walk, I shall take longer to drive than to walk. Such faults are evidently not so much errors in the process of reasoning—fallacies *in dictione*—as material fallacies. They lie in the preliminary steps of the reasoning, and not in the process itself.

IMMEDIATE INFERENCE

(Form of Thought $\begin{matrix} A : B \\ : \\ a : b \end{matrix}$)

In this mode of thinking, as in analogy, two simple relations are compared, but the form of thought differs from analogy in that, not only are the relations compared and assimilated, but the homologous terms also are assimilated; and it differs from the mode of reasoning last

considered, in that this assimilation of the homologous terms is not antecedent to, but is a part of, the reasoning process itself. It is the first step in the process, and it is an inseparable part of the process. It is by means of the assimilation of a pair of homologous terms that the relations are assimilated. In the previous mode of thought, the homologous terms were indeed alike in kind, but they had not the close similarity that they have in immediate inference, nor was it through their assimilation that the ratios were assimilated. The ratios were assimilated directly as wholes, and not gradually by pairs of homologous terms, as in the present form. Immediate inference has always been confused with the syllogism, a form of thought from which it is, as we have seen, quite distinct.

All the cases ordinarily given as instances of Barbara—the mortality of Socrates, the warm-bloodedness of this bird, and so forth—are examples of immediate inference; but the commonest example of immediate inference is in the process of perception, which we have already adduced as an example of syncrisis, and which we shall adduce hereafter as a case of memory, the fact being that all forms of thought have a common origin, arise out of the same root, and in their simpler examples merge into each other, or rather, have not yet attained distinctness.

If I perceive this object before me to be an apple, the perception is the establishment of a relation of coexistence between the appearance before me and the various attributes which I summarise in the name "apple"; it is the establishment of the relation $a : b's$. This relation is established by assimilating the term a, the appearance before me, to A, the memory of many similar appearances, previously experienced; and the first step in the process is the establishment of the relation of similarity of a to A, or $\frac{A}{a}$. But between A, the generalised appearance, and B, the other attributes, of odour, taste, consistence, weight, edibility, and so forth, there is already a coherent relation of coexistence established in my mind; and the assimilation of a to A enables and compels me to establish the relation $a : b$ in consonance with the relation $A : B$ already established by its constancy in experience. So that the whole form of thought is $\frac{A : B}{a : b}$. The two relations are assimilated by means of the assimilation of the first pair of homologous terms.

It would be contended by those who adhere to Mill's connotation of the term that this is not perception, but something more. "I affirm, for example, that I hear a man's voice. This would pass, in common language, for a direct perception. All, however, which is really perception, is that I hear a sound. That the sound is a voice, and that voice the voice of a man, are not perceptions, but inferences." Mill, in this passage, would exclude what are here called percepts from the connotation of the term. But while I agree with him that the thought that the sound is a voice, and that voice the voice of a man, are inferences, I should still call them percepts; and in this I should be supported by the general practice of to-day. The restricted meaning which Mill attaches to perception is now reserved for sensation, for which there would otherwise be no place; but the passage that I have quoted is interesting as proof that what we now call perception was in his opinion a form of inference, and as indicating that we are justified in so regarding it.

If the current use of the term perception is accepted, it will be admitted without demur that when the visible qualities of an apple are presented, we perceive that it is solid; we perceive that besides the side that is presented to us, it has another side; we perceive that it is approximately globular in form; that it is heavier than a soap bubble, lighter than a cannon ball of the same size; and so forth. But are we entitled to say that we perceive that it has five carpels, and that each of these carpels contains two pips? Are we entitled to say that we perceive that it is composed of carbon, oxygen, hydrogen, and nitrogen in certain fixed proportions? or that it contains starch and sugar and vegetable acids? Clearly it is consistent with usage to speak of the first group of qualities as perceived when the apple is in view, and equally clearly it is inconsistent with usage to speak of the second group of qualities as perceived. Yet the qualities of the second group are as invariably associated with the presented attributes as are those of the first. Why, therefore, may we regard the first as part of the percept, and not the second? The basis of the difference seems to be this: that the word perception is limited to those represented attributes which rise spontaneously and prominently before the mind when the presentation occurs; that is to say, to those attributes which have been in experience most frequently associated with the presentation; while represented attributes, which, having been less frequently associated in experience with the presentation, and which therefore do not arise spon-

taneously and prominently in association with it, but have to be sought for, and brought into consciousness, are said to be, not perceived, but inferred. If the meaning of perception were that to which Mill seeks to limit it, it would, of course, be exceeding the connotation of the term even to say that we perceive the apple to be round, to be smooth, to be about three inches in diameter, since none of these attributes is actually presented, but the current use of the term would undoubtedly permit of the perception of these attributes, although they are well known to be inferences. When a body having the presented qualities of a man is in the purview of my senses, there is immediately called up in my mind a representation of those attributes which are not presented, but which have most frequently been associated in experience with the presented attributes, and these represented qualities, which are instantly, spontaneously, and prominently called up by the presentation, I am said to perceive. Prominent among these represented attributes is the artificial attribute of the name "man," and I perceive that the appearance is that of a man. At the same time, I perceive that he has the power of spontaneous movement, of speaking, of thinking, of understanding when spoken to, and so forth—attributes none of which are at the moment, and some of which cannot be, presented to my senses, but all of which have been associated with the presentation on every occasion on which it has been experienced. Along with these may be aroused the presentation of other attributes, such as the possession of a brain and liver, of ability to walk backwards and to play skittles, of mortality, and so forth—attributes which do not arise spontaneously and prominently before the mind when the presentation occurs, but which, when aroused, can be associated in a relation of coexistence with the presented attributes, by assimilating this relation to similar relations which have been constant in experience. These attributes cannot be said in any accepted sense of the term to be perceived. They are inferred; and the difference between the inference and the perception is solely the difference between a relation that has to be established with more or less of effort, and a relation that arises spontaneously. So, when I see a piece of iron, I am said to perceive that it is hard and rigid, since these are attributes that have been so frequently associated in experience with the presentation that the representation of them arises spontaneously when the iron comes into view; but that the specific gravity of the iron that I see is 7·8, and that its melting point is 2,000° F., I do not perceive, but infer; and the only

difference between the perception and the inference is that the inferred attributes do not arise spontaneously, but have to be sought for, because their association in experience with the presented qualities is infrequent.

But the association of presented qualities with one another presents all degrees of frequency in experience, from that of resistance with extension, which is never absent from our waking consciousness, to that of, say, melting iron with a certain temperature, which we may have observed once only; and correspondingly, the process of perception merges into that of inference through an infinite number of shades of gradation, the borderland being occupied by processes to which either term may be correctly applied; and that which to one person is a percept may be to another person an inference, according to the frequency or infrequency of the experiences in which the terms of the relation have been presented together. When we see treacle being poured out of a jug, we perceive at once that it is both liquid and sticky; for both these qualities, having been frequently associated in experience with that appearance, arise spontaneously in the mind when that appearance is witnessed. But whether we perceive that it is sweet or whether we infer that it is sweet, depends upon the number of experiences in which sweetness has been associated with the presented attributes. If it has been a daily article of diet for years, the representation of sweetness rises spontaneously in association with the appearance, and we perceive that it is sweet. If we have tasted it but once, and that some years ago, the representation of sweetness does not arise spontaneously, but has to be sought for, and we do not perceive, but infer, the sweetness.

In any case, the process of immediate inference, like that of perception, is the assimilation of two relations by means of their direct and immediate comparison. It is: Since the coexistence of these presented with these represented attributes is constant in experience, therefore in this case there is a coexistence of these presented with these represented attributes; or *A's* : *B's* is like *a* : *b*. As in perception, the link which enables us to assimilate the two relations is the given likeness of one term in the first relation to one term in the second. I can infer that this apple has ten pips, that this man has a brain, that this iron has a melting point of 2,000° F., only because the presented attributes of this apple, this man, this iron, are like the

presented attributes of other apples, other men, other pieces of iron. So that, in order to represent the whole of the inferring process, we must add to the relation of likeness between (*A's* : *B's*) and (*a* : *b*) a relation of likeness between *A's* and *a*. The whole process is then as in perception :—

$$\begin{array}{rc} & A's : B's \\ \text{is like} & : \\ & a : b, \end{array}$$

or, since *a* is like *A's*, therefore it bears the same relation to *b* as *A's* bear to *B's*.

Perception, like most other words used in psychology, is by no means constantly used in the same sense. While the sense in which it is here employed, as the association of presented with represented attributes or the assimilation of a relation, one term of which contains presented elements, with another relation which is constant in experience, is the usual, and in the present state of psychological doctrine the proper meaning of the word, it is often used colloquially to connote the association, not of presented with represented attributes, but of some presented attributes with other presented attributes. I am said to perceive that this man standing in front of me has red hair, that this stick is so tough that I cannot break it, that this apple is yellow, this iron cold, and so forth.

When the indefinite relation which is to be rendered definite by inference contains no presented elements, the process of defining it varies from a memory to an inference proper, in the same way and under the same conditions as, when the first term is presented, it varies from a percept to an inference. That the apple that I saw yesterday was ripe may be a memory—the memory of a percept, if at that time the appearance of the apple called up spontaneously in my mind the representation of ripeness. If at that time I did not perceive, but inferred from the appearance of the apple that it was ripe, the remembrance of its ripeness is a remembered inference. If the remembered appearance of the apple is such that I can assimilate it to the remembered appearance of other apples whose ripeness was constant in my experience, the establishment of this relation is either a memory or an inference according as the remembered appearance spontaneously calls up the representation of ripeness, or according as this representation has to be sought for and the relation established with deliberation.

So that when I perceive that the sovereign before me is newly

minted; when I remember that the sovereign that I have just lent was an Australian coin; and when I infer that my debtor will repay me—I perform identical mental operations. In each case I assimilate a particular relation to a more general relation which I have found constant in experience. In the first case, the relation between the lustrous surface of the coin and the recentness of its mintage is assimilated to the relation, constant in my experience, between a similar lustrous appearance of other coins and the recentness of their mintage. In the second, the relation between the device on the coin and its Australian origin is assimilated to the relation, constant in experience, between a similar device on other coins and their Australian origin. In the third case, the relation between the lending of the coin to Caius and its return in due season is assimilated to the relation, constant in experience, of the lending of previous sums to him and their punctual return.

Here a very obvious suggestion presents itself. So far we have treated of those inferences only which consist in the assimilation of a newly conceived relation to a relation that is constant in experience. But how if the experienced relation has not been constant? Among our continuous experiences of relations, some are absolutely constant, in some the constancy is broken from time to time by exceptions more or less frequent, and some again are so variable that it would be a distortion of language to predicate constancy of them at all. When a newly conceived relation is compared with an experienced relation that is not constant, what is the character of the inference, and what the resulting state of mind? The *process* of reasoning is manifestly still the same. It is still the comparison and assimilation of two relations. The difference is that the datum or major premiss is no longer absolutely constant in experience, but is a relation that has been experienced, though not constantly. This want of constancy in the premiss is reflected in the want of assurance of the conclusion. The more completely constant the experienced relation, the more completely certain is the conclusion. As soon as inconstancy enters into the one, doubt enters into the other; and the relation between constancy and inconstancy in the premisses is reflected in the probability or improbability of the conclusion. This subject will be pursued further on under the head of Probability.

FAULTS OF IMMEDIATE INFERENCE

Immediate inference being the assimilation of two relations by means of the assimilation of their first terms, all that is necessary for its correct performance is that the assimilated homologous terms should be alike, and that the relation inferred should be like the relation in the premiss.

If I have found that my woollen jerseys have shrunk so much in washing that I cannot get them on, and if I argue that therefore this jersey, which I am importuned to buy, will behave in the same way in the wash-tub, the reasoning is valid only if *a*, the offered jersey, is like *A*, the spoilt ones. If *a* is made of cotton or silk, the necessary resemblance between *a* and *A* is absent, and the conclusion is invalid. If, on the other hand, the jersey is woollen, like those of whose shrinkage I have had experience, and I infer that therefore it will shrink if washed in cold water, the error lies in assimilating the conclusion to a major premiss which it does not resemble, for my jerseys have shrunk in consequence of being washed in boiling water. In this case *a* is correctly assimilated to *A*, but *a* : *b* is wrongly assimilated to *A* : *B*.

It will not be necessary to examine faults of perception again in this place, since they have already been sufficiently dealt with, but we may devote a little consideration to corresponding faults upon a somewhat higher plane. A defect which parallels imperception is the failure to assimilate a present (not presented) state of mind with relations experienced in association with similar states. Here, as in imperception, the defect is so purely a matter of degree that it is impossible to define its limits, and all that can be done is to give descriptive instances. My gardener comes to me and proposes to plant a fruit tree against a certain bare patch of south wall. I ask him if he has not noticed that the wall is overhung at that place by a horse-chestnut tree; and he admits that he has, but he fails to see the relevancy of the question. The failure is an instance of the defect that we are now considering, a defect which is indicated by the phrase, "You might have known." Suppose that I let him put in a peach or a pear at that spot, the comment that any spectator would make, when he found that the tree did not thrive, would be, "You might have known that the peach would die; how could you expect it to live under a horse-chestnut?" In other words, "You have

found throughout your life that nothing will thrive under the shade of a horse-chestnut, and yet you failed to infer that the peach would not thrive. The relation of the peach to the horse-chestnut being in your mind, you failed to associate this relation with the consequent death of the peach; you failed to complete this relation in consonance with a relation of sequence that has been constant in your experience." Or again, "You might have known that that screw would draw; the hole was evidently too large." "You might have known that your Bill would not pass; such measures have never succeeded." "You might have known that he would not be there, for when did he ever keep an appointment?" The frequency with which we use the expression, "You might have known——," testifies to the frequency of the fault which occasions it; and this fault is the failure to draw an inference which might have been drawn from the facts at our disposal—from memories of similar relations which have been experienced. Whether the defect is a defect of memory, in that the previous experiences are not remembered at the appropriate time, and upon the suggestion of their like; or whether it is a failure of the process of comparison of the present instance with past instances; or whether it is failure to discern likeness among the relations compared; depends upon the conditions of the particular case, and is not always easy to decide, nor is it of practical importance. If the experiences of the similar relation have been few, distant in time, and unimpressive, the fault is likely to be in memory. If the differences between the present case and previous cases are conspicuous, and the likeness, however relevant, inconspicuous, the principal burden of defect may lie on the process of comparison. If, upon comparison, the likeness is not discerned, the defect may be resolved into defect of abstraction, since, if the requisite common quality exists, the inability to discern the likeness must depend upon failure to discriminate this quality; and the analysis may be pushed still further, for lack of discrimination of discriminable states depends for the most part upon lack of attention. From this brief analysis, which might easily be extended, we see again how inseparable, in the actual operations of the mind, are those processes which we analytically distinguish; how, not only are faults of inference faults of abstraction or of generalisation, but how, in each process of thought, memory and volition are concerned as necessary factors; how the same error in result may be due to defect of either of these factors; and how the integrity of each is necessary to the proper working of all.

The erroneous assimilation of the two homologous terms—of *a* to *A*—is evidently comparable with illusion in the process of perception, and it is sometimes, and not incorrectly, styled illusion in current speech. If I argue that, since paste is a good bait for roach, it will be an equally good bait for jack, I am committing a fallacy of this description. I am assuming a similarity between roach and jack, which, for the purpose of my argument, does not exist; and I must not be aggrieved if a more experienced angler tells me that if I suppose that I shall catch jack with paste, I am under an illusion.

Delusion, when once it is formed, is an erroneous belief, and will be considered under the head of Faults of Belief; but the process of formation of a delusion is a process of thinking, of inference, and should be dealt with as a fault of immediate or of mediate inference, if we were able to identify the mode in which delusions originate. But this we cannot do. We do, in certain cases, actually witness the gradual formation of a delusion, in the sense that we witness its advance from a mere conjecture to a probability, and from a probability to an unalterable belief; but, although we can witness the gradual increase in the cohesion of the correlative terms of the thought, we can never discover the actual process by which these terms were originally brought together. In some cases we can hazard a conjecture as to the mode of correlation, but in the majority of cases even this is beyond our power. When a man imagines deludedly that his wife is imprisoned in the coal cellar, or that people dress in blue in order to annoy him, or that he was blown to pieces at the Battle of Waterloo, or that he has four hundred children, we are utterly at a loss to imagine how the notion got into his mind. But there are some forms of delusion which we can suppose to be originated by a faulty process of inference, though we cannot rest the supposition upon any firm assurance. We may imagine, for instance, that such delusions as the common beliefs in persecution by occult influences and unseen persecutors have some such origin as this. It is a frequent experience that effects, which cannot be traced to the operation of known laws of inanimate nature, are due to the intentional action of voluntary agents. The patient suffers from various painful sensations which he cannot trace to the operation of any mode of inanimate causation, and he attributes them to the intentional action of a voluntary agent. The faulty nature of the inference is obvious, as is the nature of the fault, but in view of the doubt as to whether this is the actual process gone through in the

formation of the delusion, it is not worth while to examine it in detail.

My own impression is that delusions come into being in precisely the same way as obsessions (which see) by the independent and quasi-parasitic formation of nervous connections, which may take place during sleep, and which are not necessarily attended by any mode of consciousness; and that therefore, if we seek the origin of delusion among processes of thought, we are looking in the wrong direction. No doubt, the normal mode of formation of a nervous connection between two areas of grey matter is by the passage of motion from the one to the other; and as the activity of each area represents a mental state, so the rush of motion between them represents the establishment of a relation between these mental states. But there is nothing in our knowledge of the formation of nervous connections to forbid the supposition that the rush of motion from one area to another is not the only mode by which nervous connections are established. In the growing brain of the fœtus and of the child, connections are made by the mere growth of nerve elements, without any such functional accompaniment; and there seems no reason why this same process should not be repeated in after life, and should not then form connections between areas that were better left apart. At any rate, I consider that the formation of a delusion is not, strictly speaking, a psychological event. It is not necessarily, I believe it is not ordinarily, the outcome of a process of thought. The delusion, the conscious belief, attends the activity of a nerve structure that has been formed, not during a process of thought, but independently of thought. The process is closely allied to that to which the name of "unconscious cerebration" has been given. If, as is beyond doubt, nervous connections may be made during sleep, so that we find that a problem that puzzled us overnight is in the morning solved ready to our hand, there seems nothing unpermissible in supposing that morbid connections may be made in the same way.

MEDIATE INFERENCE

FORM OF THOUGHT $\begin{matrix} & A : B \\ \therefore & & \therefore \\ a : b & : & a' : b'. \end{matrix}$

Supposing that I desire to ascertain the cost of extending, for another 60 yards, a fence which runs for 100 yards along my boundary, and which cost me £37 10*s.* to erect. The result is attained by casting the reasoning into the form of a rule-of-three sum: 100 : £37 10*s.* :: 60 : x. This is a statement that the relation between 60 yards and its cost is like the relation between 100 yards and its cost. It is a case of what has been called proportional inference, of the form $(a : b)$ is like $(a' : b')$; the homologous terms having been previously assimilated. Of these two relations, the one is definite, and the other, at first indefinite, is defined by the definition of its indefinite term, which is the object of the reasoning. So far the process is the same as that already dealt with under the head of Proportional Inference, and what has been stated is usually regarded as the whole of the process. But a little consideration will show that this is not the whole of the process. Underlying the assimilation of these relations there is an assumption, without which the reasoning would be invalid, and the result erroneous. It is assumed throughout the process that the extension can be carried out at the same cost per yard as the original erection. If this is not true—if prices have meanwhile risen—the relations cannot be assimilated, and the price of the extension cannot be ascertained until allowance has been made for the rise in prices. In other words, the two relations can be assimilated only by the assimilation of both to a wider and more general relation which includes them both; and the complete process of thought is not merely $(a : b)$ is like $(a' : b')$, but $(a : b)$ (the relation of a's to b's being constant), is like $(a' : b')$; or

$(a : b)$, : $(a$'s : b's$)$: $(a' : b')$; or $\begin{matrix} & A : B \\ \therefore & & \therefore \\ a : b & : & a' : b' \end{matrix}$

A traveller is stung by an insect whose like he has never seen before, and infers, upon seeing a second specimen of the same species of insect, that it also possesses a sting. In thus reasoning, he assimilates the relation of coexistence between this insect and a sting to the relation of coexistence between that insect and a sting, and the form

of thought is $a : b$ is like $a' : b'$, the homologous terms being like in nature.

Proceeding on his journey, he is presently attracted by a rustling in the dry grass, which he finds to be due to the movement of a snake, and shortly afterward, upon again noticing a rustling in the grass, he infers that this also is due to the movement of a snake. The form of reasoning is: the sequential relation between this sound and the movement of a snake is like the sequential relation between that sound and the movement of a snake, or $a : b$ is like $a' : b'$.

Presently he meets a native of the country whom he finds to have lost the sight of one eye, and a short time afterward, seeing another native at a distance, he infers that this man also has lost the sight of one eye. Again the inference is: the relation between this man and blindness is like the relation between that man and blindness, or $a : b$ is like $a' : b'$.

Now it is evident that these three inferences differ widely in validity. In the first case it is regarded as certain; in the second it is merely probable; in the third it is absurd; and consequently the ground of the inference cannot be equivalent in the three cases. As stated, the ground of the inference is, in each case, the single experience of a relation like that which is inferred; and in each case the circumstances do not admit of more than a single experience of the inferred relation previous to the inference. There must therefore be some other ground of inference, some other warrant, some other element in the reasoning beyond mere assimilation of the one relation to the other relation; otherwise the three instances would be on all fours with each other, and no more or less certainty would be warrantable in any one case than in the other two. The question is, What is the difference which makes the conclusion, reached by the same method of reasoning, in some cases true, in others probable, in yet others improbable? Is it said that the difference is not in the form of the reasoning, but in the matter reasoned about? Then the difficulty is removed but a short step further back, for at once the question arises, What is the material difference that leads to such different results?

It is manifest that the establishment of the primary relation of likeness between the two subsidiary relations is not the whole of the reasoning process. If the traveller is justified in concluding that because one insect of a certain appearance possesses a sting, therefore a second insect having a similar appearance possesses a similar weapon,

it is clear that his justification lies in his previous knowledge of insects —in his previous experience of the connection between the appearance of insects and their internal structure—and that this knowledge enters into the inference by which he reaches the conclusion that the second insect, like the first, possesses a sting. If his inference were solely, "because that insect possessed a sting, therefore this similar insect possesses a sting," it would have no more validity than the inference, "because this man has a knife in his pocket, therefore that man has a knife in his pocket." The inference derives its validity, not alone from the establishment of a likeness between two particular relations, but from a further more general relation, which, though unexpressed, is necessarily implied in the reasoning, and to which both the subsidiary relations are assimilated. That the second insect has a sting he is certain, not merely because the first has a sting, but because, in addition, it is already known that the appearance of an animal is an index to its structure; in other words, because the relation of external appearance to internal structure has been constant in experience. So that the whole argument actually present in his mind is not merely "because that insect had a sting, therefore this similar insect has a sting," but "because that insect had a sting (and because the relation between the appearance and the structure of insects is constant in experience), therefore this similar insect has a sting." Or, "Because the relation of the appearance of insects to their structure has been found constant in experience, therefore the relation between the appearance and the structure of these two insects will be found constant." Or $a : b$ is like $A's : B's$ (which is constant in experience) is like $a' : b'$.

At first sight it may appear that this argument is capable of being expressed syllogistically, thus—

In all insects the relation between appearance and structure is constant;

These two objects are insects;

therefore

In these two insects the relation of appearance to structure is constant.

But such a statement of the argument would be inaccurate in a vital point. In the implied relation, which forms the foundation or major premiss of the argument, nothing is said about all insects. The statement is that in our experience the relation between the appearance

of insects and their structure is constant But our experience does not include all insects. We have not examined all insects. We have examined but an insignificantly small minority of insects, and we are not entitled to predicate as our major premiss anything beyond the purview of experience. All that is included in the implied major premiss is that, as far as our experience extends, the relation is constant, and when we find a relation to obtain uniformly in a very large number of cases, we are not only justified in inferring, but by the constitution of our minds obliged to infer, that, in newly occurring instances of the first correlative, the second will be found associated with it in the experienced relation.

In the second case, in which the traveller inferred that the second rustle in the grass was due to a snake, from the fact that the first rustle was due to that cause, there is similarly an implied major premiss. The mere fact that a previous rustle had been found due to the same cause was not the whole of the grounds of his conclusion. He would never have ventured to draw such an inference but for the fact that there was in his experience a constant relation between localised movement and its causation by animals. In the previous case the reasoning was: Since the relation of the appearance of insects to their structure is constant in experience, therefore the relation between this specific appearance and this specific structure is constant; or, since the one insect possesses a sting, therefore the other, which has a precisely similar appearance, also possesses a sting. To assimilate the present case with the last, the reasoning should be: Since the relation between localised movement and its causation by animals is constant in experience, therefore the relation between this specific movement and this specific animal is constant, and as the one was caused by a snake the other is caused by a snake. But the two movements have not a specific resemblance. There is no such identifying specificity of resemblance between the two rustlings as there is between the appearances of the two insects, and therefore, since the first terms of the relations are not specifically alike, no specific similarity can be predicated of the second terms. But in so far as the first terms can be assimilated, in so far are we justified, in the face of the general relation or major premiss, in assimilating the second terms. And the first term can be to some extent assimilated; for the rustling in the grass in the second case is in the same district as in the first case, and it is of the same intensity and extensity as in the first case. We are there-

fore justified in inferring from these similarities in the first terms a certain similarity in the second terms. We are justified in inferring that the second rustling is produced not only by an animal, but by an animal of about the same size as that which produced the first; nay more, since the first was caused by a snake, and this is in the same district, the similarity in locality of the first terms imparts a certain degree of probability to the inference of the similarity of the second terms. Since, however, exact specific identity of the first terms is unattainable, inference of the exact specific identity of the second terms is not justifiable. We can infer only that the rustling is likely to be due to a snake.

There are circumstances in which the probability of the inference would be greatly increased, and would even merge into certainty. If there were some identifiable character in the rustling produced by the first snake, which was peculiar to the rustling produced by it, and had never been observed in the rustling produced by other animals, then the presence of the same feature in the second case of rustling would justify an assimilation of the second terms, corresponding with that of the first.

Or, if the traveller is familiar with the country, and has very often found that rustling in the grass has been caused by snakes and never by any other animal, then he is justified in inferring that a new rustle is caused by a snake, but in such a case the reasoning is of a different character. It is now an immediate inference from the constancy of *A's* : *B's* to *a* : *b*.

So long as the inference is mediate, and depends upon the assimilation of two relations to each other by means of their assimilation to a relation of greater generality, the degree of definiteness that can be ascribed to the inferred relation depends upon the degree to which the first term of this relation can be assimilated to the first term of the given relation.

The validity of the reasoning depends, however, upon the constancy in experience of the general relation or major premiss. If this be indeed constant in experience, the reasoning is valid according to the degree of constancy, but if it be not constant the reasoning is invalid. In the present case the assumption, underlying the inference that the second rustling is due to a snake, is that localised movements of objects are generally due to animals. But this relation, although of a high degree of constancy, that is to say, although it has been very

frequently experienced, and has been experienced with very few exceptions, is yet not quite uniform in experience. There have been experiences of localised movements of objects which were due to other causes than animal movements. So that the inference, that the second rustle was due to a snake, is open to two sources of fallacy. As the two first terms of the subsidiary relations cannot be exactly assimilated, the two second terms cannot be exactly assimilated, and the movement may be due to some animal other than a snake; and as the major premiss is not constant in experience, the assimilation of the relations attains only to a probability, and not to a certainty, that the rustle was due to an animal at all. It may have been due to a fruit falling from a tree and rolling down a bank.

The traveller's third inference was, it will be remembered, that since the first native that he meets with has lost an eye, therefore the second native also, who is too far off for the fact to be observed, has lost an eye. In this case the inference is obviously invalid, and the reason of the invalidity is that the assumed major premiss, that there is a constant relation between the natives of a district and the accidents which they have suffered, is false; that is to say, the relation is not constant in experience; and since its constancy in experience is necessary to the validity of the inference, the inference is invalid. That this is so is shown by assuming the relation to be constant. Let us suppose that the traveller is aware that he is approaching the border of a district that he has visited before, and that on his previous visit he found that all the children were attacked by *ophthalmia neonatorum*, which affected one eye only, and never failed to destroy the sight of that eye, so that all the inhabitants of that district were in fact one-eyed. Now when he sees a one-eyed native, he is justified in inferring that the next native he sees is one-eyed, and he is justified because the relation, between the natives of that district and blindness of one eye, is constant in his experience.

In the three cases given, the reasoning is from particular to particular, and it is evident that what is true of this mode of reasoning is *a fortiori* true of reasoning from particular to general, and from particular and general to universal. In each case the reasoning may be mediate, and may be effected by the comparison of two relations to a third more general relation or major premiss, which is rarely expressed, but which is implied or assumed in the argument; and

in each case the validity of the inference will depend in part upon the degree to which the first terms of the subsidiary relation can be assimilated, and in part upon the constancy in experience of the major premiss; and is complete when only the assimilation is complete and the constancy in experience is complete.

"Never have a servant from the Isle of Dogs," says a lady, "they are very dishonest." On inquiring for the grounds of her statement, it appears that she once had from the Isle of Dogs a servant, who turned out to be dishonest. The formal process of reasoning would appear to be: This servant from the Isle of Dogs was dishonest; therefore all servants from the Isle of Dogs are dishonest. $A : B$ is like $A's : B's$. But this cannot be the reasoning process, for she has admittedly never known another servant from that locality. Implied in the argument there is manifestly the assumption that there is a constant relation between the honesty of servants and the district from which they are derived; so that the whole of the argument is: Because there is a constant relation between the honesty of servants and the district from which they come, therefore there is a constant relation between the dishonesty of this servant from the Isle of Dogs and that of all other servants from the Isle of Dogs, or $A : B :: A's : B's :: A' : B'$. But the relation assumed to be constant is not constant in experience, so that the argument is invalid.

That this assumption is actually inherent in the argument, although quite unavowed, is shown by the test of asking for a reason. When the lady was asked for her reason for the statement that all servants from the Isle of Dogs are dishonest, she says that the servant that she had from that locality was dishonest. Her interlocutor would probably reply, and quite properly, that that was no reason. It is not the reason. The reason is the assumed major premiss, that the relation of the honesty of servants to the locality whence they come is constant. The statement, that her servant from that locality was dishonest, is not the reason, it is the *proof;* and, as in this case, so generally, the major premiss is called the Reason, the minor premiss is called the Proof, and neither is sufficient without the other to establish a conclusion. The moment that the reason is added to the proof, the argument is complete. If we are asked for further proof of the existence of the assumption, and why the lady may not actually infer, as she thinks she does, directly from $A : B$ to $A's : B's$, we shall find it in displaying the consequence of altogether omitting

the assumption. If the assumption of a major premiss were altogether omitted, it would be possible to infer that since there is a star distant 5° 6′ 41″ from the pole star, therefore every star is at that precise distance from the pole star. Such an inference would be so manifestly preposterous that it would never in practice be drawn, even by the most illogical mind, and it is preposterous, not because there are innumerable stars at other distances from the pole star than the distance alleged —that is the proof, not the reason of the preposterousness—but because the two relations are not assimilated to any general relation or major premiss; because there is in experience no constant relation of the distances of the stars from one another.

Inference from one to all may be quite valid, and will be so if the assumed major premiss is constant in experience. For instance, I may justifiably argue that since this insect has a sting, therefore every similar insect has a sting, and the validity of the argument depends upon the constancy in experience, which in this case is very high, of the relation of the appearance of animals to their structure.

"Any play by the author of the *School for Scandal* and the *Rivals* is sure to be witty" is a common form of inference by induction from some to all. It rests upon the assumption that there is a constant relation between the authors of plays and the wit that their plays exhibit. If the relation is indeed completely constant, the inference is valid; and according to the degree of constancy of the relation is the degree of validity of the inference. In this case the general relation is not constant in experience, for, in fact, different plays by the same writer exhibit very different degrees of wit; and, in the very case instanced, we find that the author of the *Rivals* and the *School for Scandal* was the author of the *Duenna* and the *Trip to Scarborough* also. It would therefore be quite uncertain, if an unpublished play by Sheridan were to be discovered, whether it would be a masterpiece or trash.

A valid inference of the same order (from some to all) is the following: The barley in this sack is mowburnt, for this handful is mowburnt that I have just taken out of it. Here the inference is from some *a's* : *b* to All *a's* : *b*, and is reached through the assimilation of both relations to the more general relation *A's* : *B*; that is to say, it is implied that the relation of the grains in a sack to their quality is constant in experience; and since this relation really is constant in experience, the conclusion is valid if the minor premiss or proof

is valid, that is to say, if the grains in the handful are really mowburnt. Similarly, if I find that in the handful that I have taken as a sample, two grains out of every five are mowburnt, I may infer by induction that two-fifths of all the barley in the sack is mowburnt, and again I assume a major premiss, viz. that the numerical ratio of different kinds of grains in a sack is constant in experience. Again the form of the inference is: Some of these *a's* : some of these *b's* :: *A's* : *B's* :: all these *a's* : all these *b's*.

Both reasoning from particular to particular and inductive reasoning may, therefore, be carried on by mediate as well as by immediate inference. It remains to be seen whether Deductive reasoning, or reasoning from more to fewer instances, may not be conducted by mediate inference. It would seem at first sight that it cannot. For if reasoning involves the comparison of one or more relations with a general relation which is found constant in experience, there would appear to be no room in the process for two general relations whose constancy has been observed. Nevertheless it will appear, on careful examination of individual cases, that Deductive reasoning is as capable of being carried on by mediate inference as is Induction or Traduction, if we may enlarge the use of the latter term so as to include the variety of reasoning from particular to particular of which instances have been given.

If it is argued that a newly discovered bird, of which dead specimens only have been examined, is warm-blooded, the form of the inference is: Since, in our experience, there is a constant relation of coexistence between avine organisation and a temperature above 100°, therefore that relation exists between this bird also and its temperature; or *A's* : *B*, constant in experience, is like this *A* : *B*. So far the deduction is an immediate inference, and, since the constancy in experience of the relation of *A's* : *B* is very high, the inference has a high degree of validity. Yet, although the constancy in experience of the relation is very high, seeing that it is quite uniform in a very large number of instances, it is evident that the certainty of the conclusion would be distinctly increased if we could give a *reason* for the high temperature of birds; that is to say, if we could assimilate the relation between birds and their temperature to some more general relation which should include this and other relations, all of which had been found constant in experience. To illustrate what is meant we will leave this instance for a moment in order to interpolate another.

A remarkable instance of the constancy in experience of a definite relation was discovered by Fermat in the region of mathematics. He found that the numeral expressed by 2^{2^x} was a prime number. He gave to x the most various values, and found that, whatever its value, the numeral expressed by 2^{2^x} was still indivisible; and he inferred from this constancy in experience that whatever new value was given to x, 2^{2^x} would still be a prime number. The reasoning was an induction from many *A's* : *B*, constant in experience, to all *A's* : *B*. But he could give no explanation, no reason, for this constancy of the relation; that is to say, he could not assimilate the relation to any more general relation, and consequently the conclusion, though admitted to be highly probable, was never regarded by mathematicians as a certainty. If it could have been so assimilated—if, for instance, it could have been shown that the *reason* of the indivisibility of 2^{2^x} was the same as that of the indivisibility of 3, 5, and 7, it would have been unhesitatingly accepted as certainly constant. But no such more general relation could be found, and at length some industrious arithmetician discovered that, although the relation holds true of all values of x until the product attains to the dimensions of more than four thousand millions, it at last breaks down, and the number becomes divisible.

The same lurking doubt must attach to the inference that a newly discovered bird is warm-blooded, unless and until the relation of avine organisation to a certain temperature can be assimilated to a wider relation which also is constant. For aught we know, there may exist, around the South Pole, birds which, like their congeners the reptiles, have the temperature of the medium in which they live; and the new specimen may be one of these. But if, in addition to the reason that the relation of birds to a certain temperature is constant in experience, we can add that the relation between the organisation of all animals and their temperatures is constant, we at once add an immense increase of cogency to the conclusion that this newly discovered bird is warm-blooded. To the observed cases of constancy in experience on which we have been depending for our conclusion, we add an indefinite multitude of other cases in which a similar relation has been found constant; and thus, by widening the basis upon which our conclusion depends, by increasing the extension of the major premiss, we add a great increase of validity to our conclusion. If this further relation be brought into the argument, the latter becomes a case, not of immediate

inference—*A's* : *B* is like this *A* : *B*—but of mediate inference—*A's* : *B* is like *A's* : *B's*, and therefore like *A* : *B*. Or: Since the relation of the organisation of animals to their temperature is constant, therefore this animal, which has the organisation of a bird, has the temperature which is found constant in birds.

That this major premiss, the constancy of the relation between the organisation of animals and their temperature, is in fact assumed, and does enter to some extent into the argument, is proved by observing the effect on the argument of its falsity. Supposing that, while the relation between the organisation of birds and their temperature had been found constant in experience, that is to say, supposing in all observed cases birds had been found to be warm-blooded; and supposing that while the majority of reptiles had been found cold-blooded, some had been found warm-blooded; and that the ornithorhynchus, the echidna, and other outlying types of mammals had been found cold-blooded; it is manifest that the same certainty would not attach to the conclusion, that a newly discovered bird was warm-blooded, as attaches to it now. If it were argued that since, in all cases in which the experiment had been made, birds had been found to be warm-blooded, therefore this newly discovered bird was warm-blooded, the cautious reasoner would say, "Not so fast! We thought that all reptiles were cold-blooded, and that all mammals were warm-blooded, until instances to the contrary were discovered. You must not be sure, therefore, that this bird was warm-blooded until you have further evidence."

If we compare this instance of mediate inference with the instance which was first given as the type of this form of reasoning, the instance of the calculation of the cost of the fencing, we find certain similarities and certain differences. We find that in these, as in every other case of this form of mediate inference, what is effected is the defining of a previously indefinite relation by the defining of its indefinite term, and that this increase of definition is effected by assimilating the indefinite relation to a definite relation by means of assimilating both to a more general relation. In the first case, the relation of the proposed fencing to its cost is indefinite, and is made definite by the defining of the indefinite term—the cost. The term is defined by assimilating the relation of the extension to its cost to the relation of the original erection to *its* cost. But this can only be done by assimilating both to the more general relation of the cost per yard. If the cost per yard has altered, the inference is no longer valid. (It may be objected that

if we know the cost per yard, we can infer directly from this to the cost of the proposed extension of 60 yards, and this is true, but we may not know the cost per yard. So long as we know that the rate per yard is unaltered—is constant—and that the original erection of 100 yards cost £37 10*s*., we can infer that the cost of the extension will be £22 10*s*., without finding the cost per yard.) In the last case, the relation of the bird to its temperature when alive is indefinite, and is made definite by the defining of the indefinite term—the temperature. This term is defined by assimilating the relation of this bird to its temperature to the relation of other birds to their temperature. So far, the processes of reasoning in the two cases are identical; but at this point a certain difference comes into view. The defining of the cost of the additional fencing is absolutely dependent upon the constancy of the major premiss. If the rate per yard has varied, we can no longer infer from the cost of the original fencing to the cost of the extension. We cannot assimilate the two relations at all unless by their assimilation to the more general relation. The major premiss is an integral part of the reasoning, it is explicitly assumed to be constant, and apart from its constancy no definite conclusion can be reached. It is prominently before the mind when the inference is made, and without explicit reference to it no inference can be drawn. But in the last case, the rôle of the assumed general relation is a subordinate one. The inference that this bird is warm-blooded may be drawn as soon as it is compared in this respect with other birds whose warmness of blood has been found constant in experience. From the added major premiss it gains, indeed, an increment of assurance. The inference is more valid, more justifiable, more assured, when the major premiss is referred to and included in the reasoning; but it is not essential to the attainment of the conclusion; and its presence in the argument, as it is less necessary, so it is less prominent. It was not immediately apparent. We had to search for it before it came into view. It was implicit, no doubt, in the reasoning, but the constancy of the relation of organisation to temperature was not explicitly assumed, as the constancy of the relation of the cost of the fencing to its length was assumed in the previous argument. It was more in the background, and occupied a more obscure position.

How is this difference in the need and in the explicitness of reference to the major premiss to be accounted for? With what other difference in the arguments does it correspond? The difference is not far to

seek. In the first case, the minor premiss—the relation between the original piece of fencing and its cost—is not constant in experience. I have not erected many fences. Perhaps I have never erected any fence but the one. This has been my only experience of the cost of erecting fences. Or, if I have erected more than one, or ascertained from my neighbours the cost of erecting theirs, I have perhaps found that the ratio of cost to length has been different in each case. The minor premiss having no constancy in experience, the whole burden of the validity of the reasoning rests upon the constancy of the major, and unless this be constant, no conclusion can be drawn. But in the last case, the minor premiss—the relation between birds and warmness of blood—has itself a high degree of constancy in experience. It has been found to exist in innumerable instances, and without any exception; and being thus constant, there is the less need to appeal to the constancy of a major premiss. Although any additional constancy that we can add, by establishing a major premiss, goes to confirm and reinforce the assurance of the conclusion, yet the minor premiss, having itself a high degree of constancy, justifies the drawing of an inference, of less assurance indeed, but, as far as it goes, a valid inference, without reference to a major premiss.

It appears therefore that, while constancy in experience of the premiss, from which a conclusion is inferred, is necessary to the validity of the inference, and so to the certainty of the conclusion, the constancy may reside in either the major premiss or the minor, and, in so far as it resides in the minor, the necessity of a major premiss is to that extent diminished. If this is so, then when the constancy of the minor premiss increases in limit, the necessity for the major disappears, and thus we are brought to the conclusion that immediate inference is not a distinct form of reasoning, but a case of mediate inference in which, the constancy of the minor premiss in experience having increased in limit, the major has become so implicit, has become so unnecessary, has retired so far into obscurity, that it appears to be altogether absent; nevertheless, even in the most immediate inferences there should be a major premiss discoverable upon close analysis, and there should be every grade and degree of indirectness of inference, from the maximum, in which a major premiss is a manifest part of the argument, as in the ascertainment of the cost of the fencing, to the minimum, in which no major premiss appears to exist, as in the inference that Socrates is mortal, since in our experience the relation between man and mortality is constant.

If, then, mediate and immediate inference are but the extreme cases of a process which exhibits every shade of intermediate gradation, we ought to be able to discover in each the rudiment, or the atrophied vestige, of the feature which in the other attains to overshadowing preponderance. This feature is, in immediate inference, the constancy in experience of an implied major premiss, in mediate inference the constancy in experience of an avowed minor premiss.

When we infer, from the constancy in experience of the relation between man and mortality, that Socrates is mortal, is this indeed the whole of the process, or is there in the background a major premiss, unavowed and implicit, but capable of being brought forward, in corroboration of the conclusion, if the sufficiency of the minor premiss should be questioned? It seems to me that there is. The constancy in experience of the relation of man to mortality in all the cases, as Mill says, in which it has been fairly tried, is maximal. The cases are innumerably multitudinous, and the uniformity is absolute; and therefore the need of reference to a major premiss is minimal. But suppose that, among other mammals, there should be known to have occurred undoubted cases of Struldbrugism; it is manifest that a shadow of doubt would be cast upon the certainty of the conclusion. We should then be compelled to argue that, although the relation between man and mortality is constant in experience, yet, as man is a mammal, and as the relation between mammals and mortality is not constant, the certainty of the conclusion, that any particular man is mortal, was impaired. The probability of the conclusion would still be very high indeed, but an element of doubt would be introduced into it. As, however, no such beings as Struldbrugs are known, either among men, among mammals, or among insects or other lower forms of animal life; as, in all animals, the relation to mortality is absolutely constant in experience, the assimilation of men to animals, and of the relation of human mortality to animal mortality, afford an immense increase of certainty to the conclusion that any particular living man will ultimately die. And if we can give a reason, not only for the mortality of men, but for the mortality of all animals; if we can include all these cases in a still more general relation which retains an equal constancy in experience, we add a further accession of certainty to the conclusion. If, for instance, we can assimilate all cases of mortality to the relation of sequence between integration and disintegration, and can predicate that this relation is constant in experience, our conclusion that any

individual man is mortal attains a certainty which may be called mathematical, since it rests upon the same grounds as our certainty with regard to numerical relations.

Seeing that these grounds of corroboration of the certainty of the conclusion exist, and are at the service of the reasoner, it is improbable that some of them, at any rate, are not more or less consciously brought into the argument by one who draws the inference that Socrates is mortal. Though he may be content, if his conclusion is not questioned, to rest it upon the constancy in experience of the mortality of men, yet if he is pressed for his reasons, if the cases of Enoch and Elijah are adduced against him, and if he be asked why all men should be considered mortal, he will scarcely fail to fall back upon the more general relations, and to bring to his aid the constancy in experience of the mortality of mammals and of animals in general.

It has been argued in a previous page that perception is a case of immediate inference, and if this is so, it follows that even in perception there is, in the background, a major premiss which is not explicit in the process, but which is implicit, and may be discovered by demanding the reason which justifies the inference. When I perceive that this object before me is a man, or an apple, or an iron bar, the inference is, as already explained, that since in experience there is a constant relation between such an appearance and such attributes, which are not now presented, therefore in this case also those attributes are associated with these appearances respectively; and here the process of reasoning seems to be complete; and no doubt ordinarily is so. But if we are asked what reason we have to suppose that the relation which we have found constant in experience will be found to obtain in future instances, we are not destitute of a reason—of a major premiss. We can say that, in innumerable instances, we have inferred from the constancy of a relation in past experience to the existence of that relation in new experiences, and that when the relation found constant has been that of presented to represented attributes, we have never been disappointed; in other words, that the relation of past cases of this relation to new cases has been constant in experience, not only in the case of men, apples, and iron bars, but in innumerable other cases also. Thus, by a new appeal to experience, by assimilating the likeness of the past and future relations to innumerable other cases in which the likeness of past and future relations has been found constant in experience, by assimilating the two relations to a more general constant relation, the

validity of the perception is confirmed and corroborated. It is true that this major premiss is not ordinarily appealed to, and the reason is clear. The constancy in experience of the minor premiss is so complete, that no need is felt for a major premiss; but the premiss is there; it is present in reserve in the background of consciousness, and can be called up in support if the minor is questioned.

Mediate and immediate inference are therefore not distinct modes of reasoning, but differ in the degree of prominence only of the major premiss. In both forms of reasoning the constancy in experience of a relation is necessary to the drawing of an inference. If the minor premiss, the relation from which the conclusion is most manifestly drawn, is constant in experience, then the reference to a major premiss is least necessary. If the minor have been found constant in only one or a few experiences, then the deficiency in its constancy must be supplied by reference to a major premiss in which this constancy exists. In both immediate and mediate inference there is an explicit and avowed minor premiss; in mediate inference there is a major which is explicit and avowed; in immediate inference also there is a major, but a major which is implicit and unavowed. The less constant in experience the minor premiss, the greater the need for the invocation of the major, and the more complete the mediate character of the inference. The more constant in experience the minor, the less need for the reference to a major, the less explicit does this reference become, the more the major retires from any ostensible part in the argument; and thus immediate and mediate inference shade off and graduate into each other.

Furthermore it is evident that the more constant the minor premiss, and the less the aid of the major is required, the more does the process partake of the nature of Deduction—of inferring directly from universals to particulars. We must be careful to keep in mind that by universals we mean, not all, but all that we know of; all that have been observed, that have been tested; all in which, to use Mill's phrase, the experiment has been fairly tried. In other words, that by all we mean no more than constancy in experience. Keeping to this meaning of the word, it is evidently a matter of detail whether we infer, from the constancy in experience of the relation of men to mortality, that Socrates is mortal; that all Greeks are mortal; or that all men that have lived, that are living, or that will ever live, are or will be mortal. The character of the inference is precisely the same, although in the

first case it is Deduction from many to one, in the second it is Deduction from many to fewer, but still many, and in the third it is Induction from many to all.

Induction from one or few to many or all may be performed with or without the aid of a major premiss constant in experience. When a major is assumed, the reasoning, if the major is constant in experience, is perfectly valid. It is clear that I am as fully entitled to draw, from the observation that this insect possesses a sting, the inference that all similar insects possess a sting, as that any particular similar insect possesses a sting. The reasoning from particular to particular and the Induction are precisely the same process, and their validity rests upon the same grounds.

When there is no major, constant in experience, to which appeal can be made, or when the constancy in experience of the major is of low value; that is to say, when the relation has been found constant in but few cases, perhaps only in the very case or cases that are appealed to in the minor, then the Induction is called an Hypothesis. When a sufficient number of uniform instances of the relation have been accumulated in experience to raise the value of the constancy of the major, the Hypothesis becomes a Doctrine.

When Newton watched the apple falling, and assimilated this relation of sequence to the relation of the moon falling towards the earth, and of the planets toward the sun, he established an Induction—an assimilation of one relation to several others—an inference from one to a plurality—for which he could adduce the sanction of no major. There was no more general relation, constant in experience, to which he could assimilate all these relations, and the inference was an hypothesis.

The Uniformitarian Hypothesis in geology is the supposition that the past changes in the crust of the earth have been produced by the same causes as are producing the changes now in progress; and is the assimilation of the relation between past changes and their causes to present changes and their causes. In order to establish this assimilation of relations between some and some others, or between $a's : b's$ and $a''s : b''s$, it would be necessary to invoke the aid of a common more general relation to which both could be assimilated. Such a major premiss must be that the relation between effect and cause is constant in experience throughout geological time, or some similar relation. But we are in possession of no such major. We have no

experience of the constancy or inconstancy of the relation between effect and cause over such long intervals of time as are concerned in great geological changes; and, as we cannot verify or validate the assimilation of the relations by the assimilation of both to a major premiss, their assimilation remains an hypothesis.

The Darwinian Hypothesis may be stated in this way: The survival of living forms is determined by their fitness to their surroundings; or, The relation of living forms to their survival is like the relation of their fitness to their surroundings. The inference by which Darwin reached this conclusion was: Since in this case, or in these cases, survival is determined by fitness, therefore in all cases survival is determined by fitness. In order to establish this conclusion it would be necessary to appeal to a major premiss, such as: There is a relation, constant in experience, between the survival of living forms and some condition in their lives. If such a relation were, in fact, constant in experience, and if a single case had been proved of the determination of survival by fitness to surroundings, then the inference from this case to all cases would be an ordinary induction; but the absence of the major reduces the induction to an hypothesis. When Darwin brought forward the hypothesis, the major had not been established. The survival, or rather, the existence, of any living form was considered to be due to the direct intervention of the Creator. It was not recognised that a living form "survived" by the operation of natural conditions, still less that the survival had any reference to a particular natural condition. We can discern in the absence of the major premiss one cause of the scorn with which the hypothesis was greeted. So far from the major premiss being constant in experience, it was completely unfamiliar, and in its absence, the hypothesis seemed the merest and most gratuitous assumption.

After the full discussion of the process of Mediate Inference and of the faults of the other thinking processes, there does not seem any need to discuss the faults of the former process at length. It will be easy for the student to apply to it the principles which have been discussed in connection with the faults of the others.

CERTAINTY

By certainty we mean the cohesion of a mental relation, or, more strictly, the cohesion in a relation of the terms of that relation; and the certainty is tested by endeavouring to divorce the terms from the relation in which they cohere. The validity of this definition of certainty will be examined in a subsequent section. At present we assume it provisionally, and seek to determine the certainty, in this sense, of the conclusions that are reached by the processes of inference.

In immediate inference there is a comparison of two relations, initiated by the discernment of likeness between their first terms. The data are the first relation and the likeness of the first term of this relation to the first term of the second relation; and from these data we infer the completion of the second relation; that is to say, we infer the existence of a second term, standing in the same relation to the first term as the corresponding term of the first relation or major premiss stands to its first term. The data are—

$$\begin{array}{l} A's : B's \text{ constant in experience} \\ \vdots \\ a \end{array}$$

The process is the establishment of the relation $a : b$, and this relation is the conclusion.

In this process there are two data—$A's : B's$ and $a : A's$, and in order that the conclusion $a : b$ should be cohesive, both of the given relations must be cohesive. Conversely, if the data are cohesive, then the conclusion will be cohesive.

Let us first suppose that the relation $A's : B's$ is maximally cohesive. Then will the certainty of the conclusion depend upon the cohesion of the minor premiss. Suppose, for instance, that presented to my sight are the attributes characteristic of a solid object. I at once perceive or infer, for it matters not which word is used, that this object possesses also the attribute of resistance. The major premiss is maximally cohesive. The relation of the appearance of solid bodies to resistance is so strongly cohesive that it is impossible to divorce its terms—impossible to think of a solid body as destitute of resistance. The minor premiss also is maximally cohesive. The likeness of the presented appearance to the previously experienced appearances of solid bodies is so great, that it is impossible to think of them as

different — impossible to think of the appearance before me as destitute of solidity. The result of the maximal cohesiveness of the two premises is a maximal cohesiveness of the conclusion. It is impossible to divorce the appearance of solidity of the object from the representation of resistance. I cannot imagine it as non-resistant. The conclusion is certain.

But suppose that the appearance is presented to my senses in twilight, and that I am uncertain whether the dimly outlined darkness that I see is a solid object or a shadow, I am no longer certain that with the presented attributes there coexists the attribute of resistance. The major premiss, the relation of *A's* : *B*, of the appearance of solid bodies with resistance, retains all its former cohesiveness. It is impossible to think of them apart. But the relation of *a* : *A's* is no longer cohesive. It is possible to think of this appearance as like the appearance of solid bodies, and it is possible to divorce these terms from this relation, and to think of the appearance as unlike that of solid bodies; and, concurrently with this relaxation in the cohesiveness of the minor premiss, there is a relaxation in the cohesiveness of the conclusion. It is possible to entertain the thought that with this appearance there coexists resistance, or that from it resistance is absent. The conclusion is uncertain, and is uncertain because of the uncertainty of the minor premiss.

An uncertainty of similar origin was for long a puzzle to zoologists. The relation of fish to oviparousness was very strongly cohesive. The similarity of eels to fish was not maximal. There were various respects, as shape, mode of breathing, etc., in which eels differed from the majority of fish, and this want of cohesion in the minor relation weakened the cohesion of the concluded relation that eels were oviparous. For a long time zoologists were uncertain whether eels were viviparous or no.

That glanders is an incurable disease every owner of horses knows; and one such owner finds that his horse has a running at the nose and a swelling under the jaw. Is his horse, then, suffering from an incurable disease? The cohesion of the relation constituting his major premiss is maximal. Not so the minor. He cannot precisely assimilate the nasal discharge and the submaxillary swelling that is present in his horse to those of glanders, and so long as this assimilation is incomplete—so long as the relation which constitutes the minor premiss is not cohesive—so long as he is free to think of these symptoms as

either like or unlike those of glanders—so long is the conclusion, that his horse is incurable, uncertain.

So long, then, as the cohesion of the major is maximal, the certainty of the conclusion varies directly as the cohesion of the minor. Upon what, then, does the cohesion of the minor depend? The cohesion is the inability to dissever the terms of the relation, *i.e.* the inability to discriminate any unlikeness in the compared attributes of *a* and of *A*'s. In order that there may be no such discrimination of unlikeness, two things are necessary. First, the representation of *A*, the first term of the major, must be clear; and second, the presentation or representation of *a*, the corresponding term of the conclusion, must be clear. If these two conditions are observed—if likeness, in all respects in which they are compared, is discerned between a clearly presented or represented state of consciousness, and another state which also is clearly represented—then there is no room, no possibility, for the discrimination of unlikeness between them, and no possibility of lack of cohesion in the relation of likeness. To say this is merely to say that consciousness cannot be in two contradictory states at the same time. It is the Principle of Contradiction applied in the region in which it is most rigorously applicable. In such a case, if the cohesion of the major is maximal, the cohesion or certainty of the conclusion is maximal.

But, it may be said, a relation may be clearly represented without being faithfully represented. Supposing that *A*, the first term of the major, is clearly and faithfully represented, and that *a*, the first term of the conclusion, is clearly represented as like *A*, but that it is unfaithfully represented, for that *a* is not in fact like *A*, what effect has this upon the certainty of the conclusion? Supposing that *A* is earthenware and that *B* is fragility, and that the relation of coexistence of *A* with *B* is constant in experience; and suppose that *a*, which I take to be a dish of glazed earthenware, is in fact a dish of enamelled iron. *A* and *a* are clearly before the mind, the one represented, the other presented or represented, and a maximally cohesive relation of likeness is established between them. To put the case as strongly as possible we will suppose that I am ignorant of the existence of enamelled iron. The relation is so cohesive that I am unable to discriminate any unlikeness at all between *A* and *a*. What is the certainty of the conclusion? Obviously it is the same as if *a* were in fact earthenware. I am quite certain that the object before me is

fragile, and will break if I throw it on the ground. Whether I ought to be certain of this erroneous conclusion, and what measures I should take to avoid it, are matters with which we are not now concerned. Regarding, as alone we are at present regarding, the course of a mental process, we see that, under the conditions stated, that mental process leads to a result which we do and must regard as certain. Whatever differences may exist between *a* and *A*, so long as we are unable to discern a difference between them, so long we are compelled to accept the conclusion that *a* : *b* is like *A* : *B*.

If, indeed, either the representation of *A* or the presentation or representation of *a* is not clear, then the relation between them may be lacking in cohesion. I know, for instance, that bloodhounds are the keenest-scented dogs in existence, but I have but a hazy notion of what a bloodhound is like, having had only a glimpse of some at a show several years ago. Having need for a keen-scented dog, I look out for a bloodhound, and am offered one which purports to be of that breed. Being a person of ordinary prudence, I place no reliance upon the statement of the dealer in dogs, and in order to satisfy myself that the animal has as keen a scent as I desire, I compare his appearance with what I remember of that of the bloodhound that I saw before. In this case *a* is the appearance of the offered dog, *A* the appearance of bloodhounds. *a* is clearly before the mind, but *A* is not, and therefore, while I can discern likeness between *a* and *A*, the cohesion of this relation is not strong. Of the sum of qualities which make up *a*, some are discerned to be like those of *A*, while as to the rest the representation of *A* is so hazy that little or no likeness can be discerned, and it is found as easy so to represent *A* that the remaining qualities of *a* shall be unlike as that they shall be like. In such a case the relation of likeness between *a* and *A* is lacking in cohesion, and the conclusion, that the dog offered to me is a bloodhound, is uncertain.

It is manifest that the same lack of cohesion will exist in the relation if it is in *a* instead of in *A* that the clearness is lacking; and that this is true whether *a* be presented or represented.

So far as the minor premiss is concerned, therefore, the clearness of presentation or representation of its terms determines the certainty of the conclusion.

Granting that the cohesion of the relation expressed in the minor premiss is maximal, upon what factor in the major does the certainty

of the conclusion depend? While it has been assumed throughout the discussion on Inference that the certainty of the conclusion depends upon the constancy in experience of the major, it has now been asserted that this certainty depends upon the cohesion of the relation expressed in the major. These two statements are consistent or inconsistent according to the connotation that we attach to the term "constancy in experience." If we expand the connotation of the term so as to include all the factors which determine the cohesion of the relation, then the expressions may stand as equivalent. If we consider that this expansion cannot be effected without stretching the sense of words beyond what is fair and reasonable, then we must admit that the attribution of the certainty of the conclusion to the constancy in experience of the major premiss was provisional and approximate only, and was subject to a revision which has now to be made.

Before entering upon this task, however, we must ascertain the conditions which determine the certainty of the conclusion in mediate inference. Since, in this form of inference, the validity of the major is determined by conditions precisely similar to those which determine the validity of the major in immediate inference, the one investigation will serve for the major of both forms. The question is, What other conditions besides the cohesion of the major are there which determine the certainty of the conclusion in mediate inference?

The answer is tolerably obvious. In immediate inference the conclusion is drawn from two data—from two given relations; and the certainty of the conclusion rests upon the cohesion of both these relations. Any relaxation of the cohesion of either deteriorates the cohesion of the conclusion. In mediate inference the data are more numerous. An additional datum is present. Symbolically expressed, the data are—

$$\begin{array}{cc} A's : B's \text{ constant in experience.} & \\ \vdots \quad \vdots & \\ a : b \qquad a' : x; & \end{array}$$

that is to say, the relation $A's : B's$ is given constant in experience, the relation $a : b$ is given like $A's : B's$, and the term a' is given like a. From these data it is inferred that there is a term b', standing in the same relation to a' as b stands to a; or, $a' : b'$ is like $a : b$; and $a' : b'$ is the conclusion. For this conclusion to be certain, the data must all be certain. The cohesion of the likeness of a' to a, and of

the likeness of *a* : *b* to *A's* : *B's* must be maximal, and when they are maximal, and *A's* : *B's* also is maximally cohesive, the conclusion is certain.

After our examination of the conditions of maximal cohesion of the minor premiss in immediate inference, it will not be necessary to investigate those which determine the cohesion of *a'* : *a*, which are manifestly the same, viz. the clearness of presentation or representation of the terms. The cohesion of the subsumption of *a* : *b* under *A's* : *B's* depends upon the clearness of presentation or representation not only of each relation, but of the several terms. If a clearly presented or represented *a* is compared with the clear representation of *A's* and is seen to be like in all the respects in which they are compared, the verdict of the consciousness in which they appear must be accepted. Not only is there no appeal, but there can be no disagreement with or objection to the verdict. The same is true of the likeness of *b* to *B's*, and of the relation *a* : *b* to *A's* : *B's*. All that is necessary is that the compared states of consciousness should be clear, and when this condition is satisfied, we have no option as to accepting the result of the comparison. If they are discerned to be like, this likeness is a certainty. We cannot doubt or question the deliverance of consciousness as to the likeness or unlikeness of mental states when the issue before it is clear. It is necessary that, not only the relations should be alike, but the terms also should severally resemble each other, for we have seen, in analogical reasoning, that relations may resemble one another whose terms are widely different.

Seeing then that, without considering the major premiss, there are in mediate reasoning at least four relations among the data which must be maximally cohesive if the conclusion is to be certain; and seeing that, for these relations to be maximally cohesive, they must be clearly presented or represented in consciousness; and seeing that, in immediate inference, there is but one relation, beyond the major premiss, which need be cohesive in order to establish the certainty of the conclusion—it will appear that in mediate inference the opportunities for the ingress of error are four times as numerous as in immediate inference, and that, consequently, the conclusions reached by the latter process are greatly to be preferred. It does not appear, however, from experience, that there is so much, or that there is any real difference in the chances of error, provided only that the processes are conducted with equal care. The difference is that, since so many more relations of likeness

have to be discerned in mediate inference, the proportion of cases, in which all the necessary likenesses in the compared mental states can be discerned, is diminished, and thus more mediate than immediate inferences remain uncertain.

Leaving now the cohesion among the minor relations, we may go on to consider the cohesion of the major premiss, which is determined by the same factors in mediate as in immediate inference. It has been said to depend upon the constancy in experience of that relation; but we now have to admit that this statement was provisional only, and that the cohesion of a relation that is derived directly from experience depends on a number of factors that can scarcely be all understood by the term "constancy." That the cohesion of the relation depends entirely upon the character of the experiences is still maintained, and every variation in the character of the experiences has its answering variation in the cohesion of the relation which is formed under their influence; so that the cohesion of the major premiss is a function of at least five variables. It varies as the experiences vary in uniformity, in frequency, in recentness, in vividness or impressiveness, and in the condition in which consciousness happens to be at the time of the experience. It will be at once seen that these are the factors which determine the faithfulness and endurance of a memory, and that this should be so is not surprising when we bear in mind that the major premiss, as a generalisation from experience, is of necessity a memory. It is not, however, regarded in this place as a memory; that is to say, we deal here not with the faithfulness, endurance, or revivability of the relation, but solely with the degree of its cohesion—with the resistance which it offers to the attempt to dissociate its terms from the relation in which they stand. To deal with this problem, we must consider separately the influence of each of the enumerated factors; and in considering each, must eliminate the influence of the others by assuming that they are maximal.

UNIFORMITY IN EXPERIENCE

As constancy in experience includes a plurality of factors, so uniformity in experience, one of these factors, is discovered upon analysis to be complex in constitution, each element of which determines a separate feature in the cohesion of the experienced relation.

The relation of coexistence between motion and a moving body is uniform in experience. The relation of coexistence between the other attributes of the diamond and solidity is uniform in experience. Uniform in experience is also the relation of the other attributes of the diamond to extreme hardness. But these uniformities are not alike—are not alike in their nature, and are not alike in their effect upon the cohesion of the relations to which they apply.

The coexistence of motion with a moving body is uniform in experience in the sense that the first of the terms has never been presented except in that relation to the second. We have had no experience of motion without the simultaneous presentation of a body moving. The effect upon the cohesion of the relation is, in the first place, that the representation of the first term is spontaneously, immediately, and inevitably accompanied by the representation of the second. It is impossible to think of motion without thinking of a body moving. The cohesion is spontaneous. In the second place, the cohesion of the relation is absolute. It is impossible to dissolve it. We cannot by any mental effort represent to ourselves motion in the absence of a moving body. The certainty that where there is motion there is a body moving is maximal.

The coexistence of the other attributes of the diamond with solidity is uniform in experience in the same sense. We have had no experience of the first term except in that relation to the second. The other attributes of the diamond have never been presented without the simultaneous presentation of solidity. Correspondingly, the representation of the first term is spontaneously, immediately and inevitably accompanied by the representation of the second. It is impossible to think of a diamond without at the same time the idea of solidity arising in the mind. The diamond is always and instantly thought of as solid. But now we are confronted with a difference between this and the previous case. Although the relation is always and instantly represented upon the presentation or representation of its first term,

yet its cohesion is not absolute. It is possible to dissolve it. We can, by a mental effort, represent a diamond without solidity. Nay, more, we may and do, from consideration of its crystalline structure, associate it strongly with the negation of solidity at some time or other of its existence. Hence it appears as if the same degree and kind of uniformity in experience gave very different values to the cohesion of the relation in respect to which they have occurred. This would be an erroneous view, however, as will be evident from a consideration of the condition, already referred to, which enables us to dissociate the relation. Our ability to dissociate the thought of solidity from that of the other attributes of the diamond lies in our power to subsume this relation under a wider relation. Diamonds are in many respects like other crystalline substances, and with other crystalline substances have been established relations of solubility, fusibility, and volatility; and the subsumption of diamonds under crystalline substances—the discernment of likeness between them—enables us to establish in the mind the same relation between diamonds and fusibility, etc., as has already been established between other crystalline substances and these attributes. If no crystalline substance, if no solid substance, had ever been found fusible, soluble, or volatilisable, we should be as unable to imagine a diamond as other than solid as we are unable to imagine motion as other than that of a moving body. If we were able to subsume the relation between motion and a moving body under some more general relation, the uniformity of which was broken by the occasional experience of its negation, we should be able to imagine—to represent in the mind—the thought of motion dissociated from the thought of a moving body. We may, if we please, express the relation of the uniformity of the experience to the cohesion of the terms of thought thus: The cohesion of the relation depends upon the constancy in experience of the first term *and its congeners* with the second term. Since, in the case of motion, there are no congeners and the experience is uniform, the relation is maximally cohesive or indissociable. In the case of the diamonds, although the experience of the relation of diamonds to solidity is uniform, yet, since the experience of the relation of its congeners to solidity is not uniform, the relation is not maximally cohesive. It is dissociable.

Although the uniformity in experience of the relation between diamonds and solidity differs from the uniformity in experience of the relation between motion and body, yet it is not to be denied that there

is a uniformity in the experience of the relation of diamonds to solidity. The one has, in fact, never been presented in experience without the other, and with this uniformity in the experience *some* uniformity, some element of cohesion in the mental relation, must correspond. That the general relation is dissoluble we have seen. It is undoubtedly possible to dissociate diamonds in thought from solidity, and to imagine their coexistence with the negation of solidity—with fluidity—and this dissociability corresponds with the want of uniformity in the experience of the general relation between diamonds and their congeners on the one hand, and solidity on the other. But the special relation, of co-existence between diamonds themselves and solidity, is absolutely uniform in experience; and this absolute uniformity should generate an absolute cohesion of a special mental relation. What is this relation? It is what we call the credibility, what we might call the *expectability* of the relation; that is to say, although we can dissociate the thought of diamonds from the thought of solidity so far as to *think* of diamonds as not solid, yet we cannot dissociate them so far as to *expect* to meet with diamonds that are not solid, or to *believe* that there are fluid diamonds. Here, then, we seem to have reached an explanation of the difference, so strongly insisted on by Mill, between believability and conceivability. Both result from the uniformity in experience of a relation. If a relation is uniform in experience, we cannot but believe that it is uniform out of experience—that in cases that come into experience it will still be uniform. Within the sphere of experience the cohesion of the relation is still maximal. If we can assimilate this relation to a wider relation which is not uniform, we can, while still unable to believe that it is not uniform, yet conceive that it is not. While, within the sphere of experience, the cohesion of the relation is maintained, yet outside of that sphere it is dissoluble. But if the relation is uniform in experience, and there is no major to which it can be assimilated, then the cohesion is absolute, and then the negation of it is not merely unbelievable, but inconceivable.

The third case of uniformity in experience that was adduced is that of the hardness of the diamond, and this differs in one respect from both of the cases already examined. With the presentation of motion goes invariably the presentation of body. There is no experience of motion without simultaneous experience of body. Not only is the negation of body never present, but body is never absent from the presentation of motion. So, too, with the presentation of the other

attributes of the diamond, the presentation of solidity has never been absent. Not only have we no experience of liquid or gaseous diamonds, but we have no experience of diamonds without simultaneous experience of their solidity. But along with the presentation of the other qualities of the diamond that of extreme hardness has not always—has but seldom—been presented. Whenever it is searched for, it is found. Whenever we test the hardness of the diamond by scratching with it substances that we know to be very hard, we never find it absent. It is always capable of being brought into presentation if we take appropriate measures, but it is not spontaneously presented. While the relation of extreme hardness to the other attributes of the diamond is equally uniform in experience with the relation of solidity to them, it is not uniform in the same sense. In the one case the second term of the relation is uniformly or invariably presented together with the first, in the other it is not always so presented, but it always may be brought into the presentation. Its opposite or negation is never presented. We have no experience of a diamond that is *not* extremely hard.

In so far as these two forms or senses of uniformity in experience of the relation are alike, in so far will their effect upon the cohesion of the relation be alike; in so far as they are different, will their effects be different. Since the diamond has never been found in experience coexistent with the negation of extreme hardness, the relation is maximally coherent within the range of experience, and we cannot dissociate it within that range. We cannot believe that any diamond is not extremely hard, nor that one will ever be met with in which this attribute is not present. Since, however, the diamond can be subsumed under other crystals, many of which are only moderately hard, it is easy to conceive of moderately hard diamonds, though we cannot believe that they will ever enter into experience. But, since we cannot subsume diamonds under very soft substances, we cannot conceive them as very soft. We cannot, for instance, imagine diamonds as soft as butter. But if we had had experience of crystals as soft as this, we should have no difficulty in imagining a diamond as soft. So far, the cohesion of the relation of hardness to the diamond is the same as that of the relation of solidity. But now we can discriminate differences between the degrees of cohesion of these two relations, dependent upon the difference in the nature of the uniformity in experience that they present. In the first place, it is much easier

to imagine the coexistence of the negation of hardness, than that of the negation of solidity, with the other attributes of the diamond. It is much easier to imagine a diamond not extremely hard than one which is not solid; and, since the only difference in the uniformity in experience of these qualities is the difference that has been pointed out, that the one has to be sought for, while the other is spontaneously and invariably presented, it is to this difference that the difference in the cohesion of the relation must be due. In the second place, the relation to solidity is spontaneously, immediately, and inevitably represented whenever the other attributes of the diamond are present in consciousness, whether by presentation or by representation. Not so the relation to extreme hardness. As this relation is not experienced until it is sought for and determined experimentally, so it is not represented until it is sought for, attended to, and brought into consciousness. We cannot think of a diamond at all without its relation to solidity being represented. We may, by an effort, dissociate solidity from its position, and substitute fluidity, but, before the thought of solidity can be dissociated from the diamond, an effort has to be made. The association is spontaneous, the dissociation artificial. With the hardness the case is reversed. We can very easily think of the diamond without thinking of it as hard. We do not, unless we are lapidaries or glaziers, spontaneously think of it as hard. The effort required is not to dissociate the thought of hardness from that of the diamond, but to associate it. It is, in fact, by no means easy to represent faithfully the extreme hardness of the diamond. If we represent to ourselves a diamond applied to a revolving emery wheel, it is quite difficult, for one who has had experience of the ease with which the wheel will grind the hardest steel, to imagine the diamond as not being ground away.

It is necessary, therefore, to recognise two kinds of uniformity in experience, and correspondingly two degrees of cohesion of the represented relation; and in each case the relation may or may not be spontaneously and inevitably represented on the representation of its first term, according as it has or has not been so presented in experience.

1. There is, first, the relation which is uniform in experience and cannot be subsumed under a more general relation that is not uniform. The cohesion of such relations is maximal. The certainty is absolute. The negation is not only incredible, but inconceivable. In some, the

relation has invariably been presented along with the presentation of its first term, and we are precluded from representing the first term without at the same time representing the second. We are not only precluded from conceiving movement with the negation of a moving body, but we are precluded from conceiving movement without at the same time and in the same act of thought conceiving a moving body. In others, while there has never been presented the negation of that particular relation nor of any congeneric relation, yet the first term of the relation has been presented alone, and thus, though we are precluded from conceiving the negation of the relation, we are not precluded from conceiving its absence. We are precluded from conceiving a body that possesses a near side and does not possess a remote side, but we may conceive a body with a near side without at the same time in the same act of thought conceiving the remote side. If we think of the remote side at all, we are precluded from thinking of it as absent. But we are not obliged to think of it, as we are obliged to think of the body, together with the movement. We can look at the surface of the earth or of the sea, for instance, without thinking of the antipodes or of the bottom of the ocean.

2. Second, there is the relation which is uniform in experience, but which can be subsumed under a more general relation which is not uniform. The cohesion of such relations is maximal in experience. The certainty in experience is absolute. The negation is incredible; but it is not inconceivable. We can imagine the first term of the relation, not merely in the absence of the second term, but in the presence of its negation. This class also is divisible into two, according as the second term has been invariably presented along with the first, or the first has been presented in the absence of the second. In the first case, the relation is always first represented as existing, and to conceive its negation requires an effort. In the second case, the relation does not of necessity arise in the mind when the first term is represented. We can think of a diamond without thinking of its hardness, but if we do think of hardness in connection with the diamond, we are precluded from believing that they do not coexist, though we are not precluded from conceiving that they do not coexist.

While, for the sake of academic completeness, the distinction is pointed out that exists between uniformities that spontaneously present themselves and uniformities that have to be sought for, and between the corresponding certainties that cannot be eluded and certainties

that can be ignored, the distinction is one that from the point of view here taken—that of the student of the disordered as well as of the normal mind, is not very important, and may henceforth be dropped out of consideration. Up to the present therefore we will take it that we have ascertained two classes or categories of certainties, viz. :—

1. Relations that are uniform in experience, and cannot be subsumed under a wider relation that is not uniform. Such relations are to us absolute certainties, and their negatives are inconceivable. We cannot even imagine an experience of their negation.

2. Relations that are uniform in experience, but can be subsumed under a wider relation that is not uniform. Such relations are to us certainties, but relative certainties only. They are certainties in relation to our experience. But their negations are not inconceivable. We can imagine experiences in which the relations might be dissolved. Relations of this class are what are ordinarily known as "Facts."

Correlative to these are the corresponding categories of what may be termed negative certainties, of which the first consists of relations, if such they may be called, whose terms cannot by any effort of the mind be brought together in that relation, relations which are not in truth mental relations, but verbal relations; which consist of verbal propositions whose meaning is unthinkable. Such quasi-concepts are those of unsubstantial substance, of immaterial matter, of double individuality, of the existence of a thing in two places at once. Such propositions we regard as certainly untrue; as absolutely false; as wholly inconceivable. To those adduced may be added such quasi-concepts as infinite extension, infinite divisibility, eternal duration, absolute hardness, and so forth. All these are relations which not only have never been experienced, but all are relations whose contradictions are constant in our experience, and all are relations which cannot be subsumed under a wider and more general relation of which any instances have been experienced.

Corresponding with the second category of positive certainties, is the second category of negative certainties, consisting of relations which have never themselves been experienced by us, and whose negation or contradiction has been constant in our experience, but which can be subsumed under a wider relation, instances of which have entered into our experience. Such relations are inconceivable in relation to our own particular experience; they cannot be conceived

as entering into our own experience, though they can be conceived out of relation to that experience; they are incredible, but they are conceivable. Of these relations the negation is regarded as true in fact, as true in relation to our experience, but as conceivably false. Of such relations we may take as an instance the possession of more than four legs by a mammalian animal. Such a relation is wholly incredible. We cannot conceive that such an animal exists, has existed, or will exist in relation with our own experience. We cannot conceive that we have met with one, or that we ever shall meet with one. But it is not inconceivable. It is not difficult to imagine a dachshund, or a turnspit dog, elongated to such an extent that an additional pair of legs is needed and is added in the middle of his length to keep his belly off the ground; and it is the less difficult to conceive this state of things since we have before us the precedent of insects, every one of which presents six legs to our observation. If we have some smattering of anatomy and biology, and find it difficult to conceive the evolution, at so late a stage in the history of the animal, of a new bony girdle—a representative of the pelvis, or of the scapula and clavicle, at the level of the hinder dorsal vertebræ—we shall find this difficulty removed if we remove the whole scene of operations to a greater distance from our own experience. We have only to conceive that in one of the other planets, either of our own or of some other planetary system, the evolution of vertebrates started from a more elongated Martian or Jovian amphioxus, which had retained or developed such a degree of affinity to the articulata of that planet, as exhibited itself in the possession of an additional pair of limbs. The possibility of conceiving a supernumerary pair of limbs added to the normal four of vertebrata is seen in the pictures of angels, in which artists have added to the human figure the wings of a goose.

LIKELIHOOD

After the full discussion of the converse case, it is not necessary to illustrate further the coexistence of incredibility and conceivability, and the factors which constitute the one and the other. It is necessary, however, to examine a little more closely the conditions of incredibility. It has been said that that relation is incredible to us, whose negation or contradictory is constant in our experience; but that if the relation can be subsumed under a wider relation, instances of which

have entered into our experience, then, although still remaining incredible, it becomes conceivable. We have now to notice that the distinction that has been drawn between what is conceivable out of experience but inconceivable in experience, or incredible, is not in all cases an absolute distinction, but is one which may be absolute, as in the cases supposed, or may become less and less until at last it disappears, and the two cases merge into one. In other words, there are degrees of incredibility, and a series of cases may be arranged in which utter incredibility at one end passes, through degrees of diminishing unlikelihood, into credibility at the other; and the degree of unlikelihood is the degree in which the conceived relation differs from any experienced relation. As the conceived relation approximates more nearly in character to a relation that has been experienced, so does incredibility become unlikelihood, and the unlikelihood diminish and merge into likelihood. That a bird should lay an egg bigger than itself, is a proposition absolutely inconceivable. The terms of the relation refuse to be brought together in the mind. It belongs to the category of negative certainties. It is certainly untrue. That a bird should lay a cubical egg is incredible; but it is not inconceivable. We can bring the terms together in the mind, and picture to ourselves the alteration in shape of the egg from an oval to a cubical form. It is wholly incredible, however, and it is incredible not only because the negative is constant in our experience, but because we have not any experience in any way resembling it. If we had experience of angular eggs, of eggs in the form of hexagonal prisms, or octahedrons, and especially if we found in experience that the form of eggs varied in allied species, we should have no difficulty in regarding as credible the production of a cubical egg by a bird whose congeneric species produced octahedral eggs. That a bird should produce a scarlet egg is certainly very difficult of credibility. So far as is known, no bird produces eggs of very conspicuous colour. We have no experience that closely resembles the occurrence—no experience of bright green, bright yellow, bright pink eggs; but we have experience of great variability in the colouring of eggs; we have experience of eggs that are wholly blue and wholly brown. We have experience of parrots, flamingoes, and ibises, in which structures of scarlet colour are produced by the bird; and hence, if we received testimony that a bird had been discovered which produced a scarlet egg, we should not be warranted in receiving the announcement with total incredulity. We

should certainly not disbelieve it as strongly as we should disbelieve in the laying of a cubical egg. And if we had actual experience of the laying of a scarlet egg—if we kept the birds in confinement under circumstances which excluded mistake or imposture, and found that they laid scarlet eggs, the identity of the experience with the concept would bring the latter out of the category of the merely credibles and into that of facts.

As, on the one hand, we have a gradual series, determined by increasingly like experiences, from incredibility through gradually decreasing unlikelihood to fact, so we have from the other direction a gradual series from fact through gradually increasing doubt to incredibility; the gradations being the same, but taking different names according to the direction in which the series is traversed.

We are now in a position to set forth a complete scale of the categories of belief, which will be as follows:—

1. Absolute positive certainty, of which the negation is inconceivable—Truth.

2. Relative positive certainty, of which the negative is conceivable but incredible—Fact.

3. Likelihood / Doubt { Of which the negative is credible, that is, both the positive and the negative are conceivable in relation to experience.

4. Relative negative certainty, of which the positive is conceivable but incredible—Negative Fact.

5. Absolute negative certainty, of which the positive is inconceivable.

The definition of Fact which is here given needs some comment. The word is commonly used in a variety of senses, and without wishing to substitute for these senses, for many of which the word is a convenient expression, the meaning which is attached to it here, it is legitimate for the purpose of this book to confine it to one sense, even though that is not the sense in which it is most frequently used. By fact, then, is meant here that of which our own experience has rendered us certain, but of which the negative can be conceived. That is to say, we can conceive the reverse to exist out of our experience, either in the experience of others or in a hypothetical experience, but we cannot conceive the matter to be otherwise in relation to our own experience. Relations which are here called truths, which are maximally cohesive, insomuch as we cannot even conceive the negation of them, are not ordinarily termed facts. We do not call it a fact that motion

implies a moving body, we call it a truth. Nor do we speak of the truth, that what presents one side to us has another side remote from us, as a fact. By a fact we may mean either an existence or an event, but in either case we mean something of which we are certain, but which might conceivably have been different—might not have existed or might not have occurred. Suppose that we see a match put to a rocket, and the rocket ascend. The existence of the rocket in its holder before the match was applied to it is a fact. It is a positive certainty within the range of, or in relation to, our experience. But its negative is conceivable, not indeed in relation to our experience, but out of that relation. We can imagine the place without the rocket, and the rocket in a different place. We can see it fired, and depart skywards, and yet imagine it waiting for the match; but when we make these imaginings we discard our own experience. For the time, we put that upon one side; and any concept that we form is out of relation to our own experience.

Here we see the source of a confusion, and I think the resolution of a difficulty, which has been felt by most writers on epistemology, and which is put very clearly by the late Professor Sidgwick in his inquiry into Criteria of Truth and Error. "The meaning of the term inconceivable requires some discussion. In replying to a criticism by J. S. Mill, Mr. Spencer—while recognising that 'inconceivable' is sometimes loosely used in the sense of 'incredible'—repudiates this meaning for his own use. But I agree with Mill in regarding this repudiation as hasty, *so far as the criterion is applied to propositions that represent particular facts.* [No italics in original.] *e.g.* 'I feel cold.' For in most cases in which such a statement is made it would not be true to say, 'I cannot conceive myself not feeling cold,' since only very intense sensation excludes the imagination or conception of a feeling opposite in quality. We might, no doubt, say, 'I cannot conceive that I am not feeling cold': but the form of this sentence shows that I have passed from conception, strictly taken, to belief. Spencer's contention that in this case the conception of the predicate-notion 'feeling cold,' with the subject-notion 'self' is for the time 'absolute,' though only 'temporarily,' seems to me to ignore the complexity of consciousness. According to my experience, disagreeable sensations, when not too violent, even tend to excite the opposite imagination: *e.g.* great thirst is apt to be attended by a recurrent imagination of cool spring water gurgling down my throat. I cannot therefore agree that

the utmost certainty in a proposition representing a transient empirical fact involves the 'inconceivability' of its negation—except in a peculiar sense of the term in which it is equivalent to 'intuitive incredibility.'" It seems to me that both the contestants in this dispute are right. That when we feel cold we can conceive ourselves not feeling cold, is indisputable; but we cannot entertain this conception in relation to our then experience. Out of relation to this experience—at another time, in other circumstances—we can conceive ourselves feeling warm, but in relation to our then experience we cannot conceive ourselves feeling warm. When Professor Sidgwick says that he has passed from conception strictly taken, to belief, I should wholly agree with him, but I should put it in another way. I should say that we have passed from conception in relation to universal experience to conception in relation to our own individual specific experience at that time and place. And in so saying I should be giving to the term "belief" a meaning which may I think well and fairly be included under it. And although I should not claim that "inconceivability" is generally equivalent to "intuitive incredibility," yet I should claim that that is to me intuitively incredible which is inconceivable in relation to my particular experience.

By inconceivability *simpliciter*, in short, I maintain that we mean, or should mean, that which is inconceivable, not alone in relation to my experience at this particular time and in this particular place, but absolutely and out of relation to my experience; that which is, so far as we know, inconceivable to all men at all places in all times; and when we speak of incredibility, we should mean that which is inconceivable by us in relation to the particular experience to which we have been subject, but which, apart from our experience, can be conceived.

PROBABILITY

"Bedlam! This is pretty sport!"—HARINGTON

So far we have discussed the effect upon the cohesion of the mental relation of the three kinds of uniformity in which the relation has been experienced, eliminating all other factors in the problem by supposing them to be constant at their maximum. The question which presents itself next in order for our consideration is as to the effect, upon the cohesion or certainty of the relation, of non-uniformity in the experiences of it.

If we designate a quality or group of qualities as A, and another quality or group of qualities as B, then we may represent the experience of these qualities, associated in any given relation, as $A+B$; the experience of A without B as A; and the experience of A in the ascertained absence of B, or of A with the contradictory of B, as $A-B$. According to this nomenclature, the subject that we have been hitherto discussing is the effect, on the cohesion of the represented relation $a+b$, of experiences of $A+B$ and of A. We have now to discuss the effect on the represented relation of the importation of $A-B$ into our experiences.

The importation of this new element into experience produces an immediate effect upon the cohesion of the represented relation. The lowest degree of certainty arising from uniformity in the experience is that in which the negation of the relation is easily conceivable, but is incredible; but the moment a single instance of $A-B$ enters into our experience, the negation of $A+B$ becomes not only conceivable, but credible also. For incredibility is merely the inability to dissociate the relation $B:A$ within the realm of experience; that is to say, to dissociate its relation to experience—to imagine the negation of $A+B$ as actually occurring in experience. We can, that is to say, conceive, or imagine, the dissociation of $A+B$ so long as we keep this thought out of relation to our own experience. But the moment we bring it into relation with our experience, the moment we imagine it as having been experienced in the past, being experienced in the present, or as about to be experienced in the future, the dissociation cannot be maintained. The terms cling together again and cannot be divorced. But the moment that $A-B$ is actually experienced, this inability is overcome. From that moment the negation of $A+B$ becomes conceivable not only outside the range of experience—out of relation to experience—but within this relation also.

Supposing, as before, that the other factors governing the cohesion of the relation remain constant, then the cohesion, already sensibly weakened by one experience of $A-B$, will be further weakened by every additional such experience, and at any given time will remain at a degree or stage which is fixed by the numericial proportions of the experiences of $A+B$ to those of $A-B$; or, as it is more commonly expressed, by the numerical proportion of the experiences of $A+B$ to the sum of the experiences of $A+B$ and $A-B$. This weakened degree of cohesion is no longer called certainty, a term which is applied to those

relations only that are uniform in experience; it is now termed Probability.

Dealing here with problems that are psychological only, the term Probability is used in the sense defined, to connote the degree of cohesion of a mental relation within certain limits. The same word is commonly used by mathematical writers on the Doctrine of Chances, to connote a certain limited class of relations among phenomena,* and it is important that the two meanings of the term should be borne in mind. The relation with which we are dealing is a mental relation, not a relation among phenomena. It is determined by our experiences of relations among phenomena, it is true, but none the less does it remain from beginning to end a mental relation. The phenomena, by experience of which the cohesion of the mental relation is determined, are, moreover, of all orders, the only condition being that the experiences of them are not uniform. The phenomena referred to by writers on Chance belong to certain classes only of phenomena that are not uniform, and to classes that are artificially determined by the arbitrary exclusion or inclusion of certain conditions.

Probability as here defined, that is to say, the degree of cohesion of the mental relation, is determined, as already stated, by the numerical ratio of the experiences in which the relation has been presented to those in which its negation has been presented. The probability of, for instance, the sequence of fine weather to a rising barometer, is determined by the numerical proportion of the experiences in which the sequence has occurred, to those in which the sequence has been violated. Being so determined, the notion has arisen, in the minds of mathematicians and logicians who are not psychologists, that the degree of cohesion of the mental relation is the same thing as this numerical ratio, and can be expressed in terms of it, so that if $A+B$ has been experienced twice and $A-B$ once, then the degree of cohesion of the mental relation may be expressed by the ratio 2 : 1; or, if the standard taken be the ratio of the experiences of $A+B$ to the sum of the experiences of $A+B$ and $A-B$ then by the ratio 2 : 3.

It is evident that these ratios are the ratios of the numbers of different experiences; and so long as Probability is understood to mean ratios of the numbers of experiences, the degree of probability is accurately expressed by them. But logicians, and especially mathe-

* The term phenomena is, of course, used here to designate phenomena outside of the mind of the observer.

maticians, have not been content with this position. They have gone much beyond it, and have inferred that, since the ratio of the experiences could be numerically expressed, therefore the degree of cohesion of the mental relation, or as they have called it, the Belief or Expectation, could be numerically expressed. Nothing could be clearer than De Morgan's language in regard to this. "By degree of probability we mean, or ought to mean, degree of belief. . . I throw away objective *probability* altogether, and consider the word as meaning the state of the mind with respect to an assertion, a coming event, or any other matter upon which absolute knowledge does not exist." "I will take it then that all the grades of knowledge, from knowledge of impossibility to knowledge of necessity, are capable of being quantitatively conceived. The next question is, Are these quantities capable, *in any case* of measurement, or of comparison with one another?" De Morgan then plunges into an argument, based upon the result of drawing balls out of an urn, the relevancy of which is not clear to me, but which enables him to answer this question, to his own satisfaction, in the affirmative. To follow him throughout the argument would be tedious, and would be needless in view of the fact that every instance without exception, upon which his conclusion is based, is an instance of experiences which are arbitrarily assumed to be capable of exact numerical estimation. His mathematical imagination runs riot to such an amazing degree that he assumes that the credibility of a witness can be estimated with accuracy and expressed in a fraction; to such deplorable straits may the most vigorous mind be reduced by habitual indulgence in the intoxicating practice of drawing imaginary balls from imaginary urns!

The onus of proof of the proposition that the cohesion of a mental relation can be estimated to a nicety, and expressed in a definite numerical ratio, lies with those who assert it; and as no proof that is satisfactory to the non-mathematical mind has been given, no refutation would here be necessary, were it not that mathematicians either assume it as self-evident, or advance arguments which to them are conclusive. Nor it is easy to shake their confidence in the stability of their position; for even if we can beguile them from their pernicious practices of throwing dice, tossing halfpennies, turning up cards, and drawing balls from urns—if we could induce them to sign a pledge, or if we could intern them in a Retreat for the reformation of habitual symbainists—we could still make no impression upon them. They

would still recur to the incurable habit of attaching imaginary numerical values to things that cannot be numerically expressed. It would be difficult to find a better instance than that of De Morgan's witness, whose credibility is placed at 2 : 1. So estimated, how easy it is for a mathematician to gauge the value of any statement, either of his alone, or of his corroborated by that of other witnesses, whose credibilities are of the same or of different values! He could determine by calculation the exact numerical relations of the amounts of faith that we ought to put upon several statements, of different antecedent improbabilities, corroborated by the evidence of twenty or a hundred such witnesses, all differing from each other in veracity. Such feats are beyond the ability of the psychologist. Even the simple statement of the single witness upon a single simple matter of fact is beyond his power to estimate with numerical accuracy. He wants to take a photograph in full sunshine, and he sets De Morgan's witness to watch for the emergence of the sun, and to come to the dark room and tell him as soon as it is shining. When the witness makes this announcement, what is the exact effect produced on the mind of the listener? The credibility of the witness is $\frac{2}{3}$rds, so that the listener should believe $\frac{2}{3}$rds of what he is told. That it is 2 : 3 in some way, we have De Morgan's authority for being sure. Is it that twice out of three times the announcement is true and the third time it is false? Or is it that two-thirds of the sun is out each time, and the remaining third behind a cloud? Or is it that the sun is behind a cloud that obscures one-third of his light and allows the other two-thirds to pass through? Or is it some combination of these estimates? Ought we to believe five times out of six that $\frac{1}{4}\frac{1}{9}$ths of the sun are obscured to the extent of $\frac{1}{3}$rd and $\frac{7}{19}$ths are totally obscured? And how if there happens to be a mock sun? What effect will this have upon the credence that ought to be attached to the announcement? No doubt a mathematician could tell us exactly which of all these and a thousand other alternatives we ought to believe; but supposing that he can and does, to what does his information amount? It amounts to a statement of experienced relations among phenomena, and a further statement that to the numerical relations among phenomena there *ought* to correspond a numerical relation in the degree of cohesion of our thoughts on the subject; but it leaves us not one whit nearer the discovery of whether there does indeed exist such a corresponding numerical relation in our minds. What are the precise thoughts that

exist in the minds of other people no one can ever say, and therefore when it is dogmatically asserted that the degree of cohesion of a relation is expressible by a numerical ratio, the onus of proof lies, as before asserted, upon those who make the statement. But thus far we have a right to go. We may put before the reader as clearly as we can what the statement implies, and let him try for himself if he can realise it—if he can divide his degrees of belief in exact numerical proportions. Let us take one of the favourite examples of the calculators of probabilities. A die is cast, and before the box is lifted, I am asked what is the chance or probability that an ace will be uppermost. I answer, as glibly as the calculator could desire, that it is 5 to 1 against, 1 to 5 for. According to my authority this answer expresses the amount of my belief, or, as I put it, the degree of cohesion of the relation in my mind. My belief that ace will be uppermost is one-sixth of certainty, so I am told, and my belief that the upper face will not be ace is five-sixths of certainty. That I am more strongly inclined to anticipate that it will not be ace than that it will, I admit; but that I can measure the degrees of inclination, and define them as standing in the ratio of 5 to 1, I must for my own part deny; and as to this I am the ultimate authority. No one can know better than myself what is in my own mind. But supposing that others are more keen in their introspection than I am, and are able accurately to apportion the amounts of their inclination, or belief, or degrees of certainty, in this precise ratio, let me put to them another problem. The calculators of probabilities have no difficulty whatever in pursuing their investigations to the minutest accuracy, and they can distinguish with certainty between a chance of $\frac{1718}{4652}$nds and a chance of $\frac{1833}{4652}$ths, and will confidently assert that these several degrees of belief ought to be—nay, I think he will maintain that they must be—entertained by every reasonable man with regard to the two events or relations to which they refer. Now if any man or woman, even a professor of mathematics, were to assure me that he could and did thus weigh out the amounts of his beliefs in scruples, pennyweights, and grains, I should conclude that either he was differently constituted from the rest of the human race, or that he was mistaken. So far from being able to discriminate such differences as this, I should imagine that, if a man accustomed to introspection were chosen at random, and were asked to represent clearly in his mind two beliefs, one of $\frac{1}{2}$ and the other of $\frac{5}{8}$ths, to approximate them, and to discriminate a difference between them,

he would proclaim his inability to take the first step in the first operation; and would say that, although he could distinguish broad differences in the degree of cohesion of his mental relations, just as he could distinguish broad differences in the unpleasantness of smells, etc., he could no more discern numerical differences amongst them than he could discern that a smell of onions was precisely ⅘ths as nasty as a smell of asafœtida. He would say that, although he could weigh out quantities of quinine in the proportions of 18 and 19 with the utmost accuracy, and dissolve them in quantities of water that were within a minim of equality, yet that, when he tasted the solutions, he could not discriminate any difference between the bitterness of the one and the bitterness of the other; still less could he apportion the ratios of bitterness in the ratio of 19 : 20; and that until he had acquired the ability of apportioning numerical values to such concrete and more discriminable states of mind as smells and tastes, it was most unreasonable to expect him to apportion numerical values to abstract and less discriminable states of mind such as belief.

This question, of the quantitative estimation of states of mind with numerical exactitutde, is an important one, and it will not be unprofitable to examine it further. Suppose that I have enjoyed for some years the advantage of living in the district served by the South Eastern Railway, and that during those years, therefore, the train by which I have returned home from town has been very frequently late. I have kept no record of the times of its arrival, but I know that sometimes a week goes by without its being once punctual, and that for it to be punctual more than twice a week is exceptional. This being my experience, I form, when I get into the train at Charing Cross on a particular evening, an estimate of the probability that I shall arrive punctually at my destination, and I put this probability low; but not even the most confirmed and habitual calculator of chances would contend that this estimate is expressible in an exact numerical ratio. The probability of being late is considerably greater than that of being punctual, and that is all that can be said. When I am seated in the train, I get into conversation with my neighbour, and, as is customary, we begin to discuss the unpunctuality of the service. He tells me that he has travelled by that train every week-day for two years, and has kept a record of its performances, and that of these 646 occasions the train has been late 518 times. Does this information

add appreciably to the accuracy of my previous estimate? Is there any change in my expectation of arriving punctually at my destination? Is that expectation increased, or is it diminished? and, if either, by how much? I maintain that it has undergone no change at all; that an introspective examination will not reveal the slightest difference in the degree of cohesion of the relation.

A quaker heard a bystander expressing sorrow at the destructive effects of a fire, and sympathy for the sufferers, and asked him, "How much art thou sorry, friend? I am sorry five pounds." The assertion was a quaint way of appealing to the generosity of the other, but did it express accurately the measure of the sorrow felt by the quaker? Can the intensity of a mental state be measured in pounds, shillings, and pence? and, if not, *what is the unit to which the numbers refer* when a mental state is numerically estimated? If one belief is measured by $\frac{2}{3}$rds and another by $\frac{4}{5}$ths, of what unit are these fractional parts? The answer of the mathematician is instant: the unit is certainty. The one belief is $\frac{2}{3}$rds of certainty, the other is $\frac{4}{5}$ths of that quantity, and so the two are comparable. Well and good, but what is this certainty which it suits us at the moment to take as a unit? Let us hear De Morgan on the point. "Are we to consider the sort of belief which we have of a necessary proposition (as two and two make four), that is, absolute knowledge, to which contradiction would be a glaring absurdity—as only a strengthened or augmented specimen of the sort of knowledge which we have of any contingent proposition (such as Cæsar invaded Britain), which may have been, or might have been, false, and can be contradicted without absurdity? I answer, we can easily show that the difference between the two cases is connected with the difference between finite and infinite, not between magnitudes of different kinds." He then takes a dram, going on, *more mathematico*, to draw imaginary balls from imaginary urns, and continues: "Suppose the rate to be one black to a million of white; the assurance is much increased, but still there is no necessity; the black ball may be drawn. Take one black to a million of million of white, or a million of million of million, etc.; long before we have reached such a point we have lost all conception of the quantitative difference between our belief in drawing a white ball and our belief that two and two are four. . . . Between the impossible and the possible, the certain and the not certain, there must be every imaginable difference, if we do not admit unlimited approach." When it suits him, he posits certainty as a

unit; but when unity does not suit him, he posits it as infinity, and we have the right to hold him to either of these values, the more so as on another page he gives us our choice. "It is indifferent, as far as the theory is concerned, what numerical scale of belief we take. We might, if we pleased, copy Fahrenheit's thermometer, set down knowledge of impossibility as 32°, perfect certainty as 212°, and other states of mind accordingly." We will take advantage of this freedom to choose our scale, and, without going outside of his own suggestions, will choose the one of the alternatives which he himself suggests, and regard certainty as infinity; and now we will compare the two beliefs which he regards as numerically comparable. One is $\frac{2}{3}$rds of infinity, and the other $\frac{1}{2}$ths of the same aggregate! What is their relative value?

We have every right, if the numerical division of any state of mind be once admitted, to apply the same principle to other states, and to estimate the beauty of a picture, for instance, as $\frac{7}{10}$ths of that of a landscape, or the amusement afforded by one joke as $\frac{3}{10}$ths of the amusement afforded by another; and if such statements are manifestly absurd, the question arises why the absurdity of the numerical estimation of the mental state of belief is not equally manifest? The answer is that it *is* equally manifest to those who can fix their attention upon the state of the belief, and exclude from consideration the circumstances to which the belief refers. In the case of the picture and the joke, the states of mind which these circumstances produce are clearly discerned to be different from the circumstances themselves. The beauty of the picture or the landscape is discerned to be different from the picture or the landscape itself. The amusement afforded by a joke is clearly distinguishable from the terms of the joke. But in the case of belief, the mental state is still confused with the circumstances which give rise to it, exactly as the mental state of colour is, by all uneducated people, confused with the circumstances which give rise to it, and the blue or green is believed to be in the sky or the grass, and not in the mind of the observer. It is easy to realise that the sound of a bell is not in the bell, but in ourselves; that the taste of quinine is not in the quinine, but in ourselves; that the pain of a burn is not in the flame, but in ourselves; but it is not so easy to realise that the odour of eau-de-cologne is in ourselves and not in the spirit, nor that the green colour is not in the grass, but in ourselves. The same variations in the difficulty, of discriminating states of mind

from the circumstances under which they occur, exists in more complex as in simpler states; and those who can recognise that such states as beauty and amusement are completely separate from the circumstances which produce them, are still unable completely to disentangle the mental state of belief from the circumstances under which belief is experienced.

If any further demonstration is needed of the incorrectness of the view which attributes to the intensity of the belief a numerical exactitude corresponding with the circumstances in which it occurs, such a demonstration may be found in Weber's law. Weber's law, as is well known, expresses the observed fact that, to produce successive appreciable differences in the magnitudes of sensations, the stimuli must increase, not in arithmetical, but in geometrical progression. So far, therefore, as we have any warrant whatever for supposing that there is a numerically exact correspondence between the degree of a belief, and the numerical proportion of the plus and minus relations under the experience of which it arises, we are obliged to suppose that the precise amount of belief, supposing it to be measurable, is represented, not by the fraction which represents the relative frequency of the experiences, but by the logarithm of that fraction!

It has seemed worth while to discuss this question thoroughly, for the view, which is here considered to be erroneous, is very widely and very firmly held; and were it not repudiated, the word Probability might easily be understood in different senses by the writer and by his readers, if any. Not yet, however, have we quite finished with the doctrines of the mathematical calculators of chances. We have still to determine the relation of what is here termed Probability to the Probability which is understood by them. By probability is here understood the degree of cohesion of a mental relation which has become established under the influence of experiences that have not been uniform. This degree of cohesion corresponds with the ratio of the uniform to the non-uniform or discrepant experiences. As used by mathematicians, the word really connotes, not the state of mind, but the ratio of the experiences. To this ratio alone are numerical processes applicable. It is true that most of the circumstances to which the calculations of mathematicians are in this connection applied, are not, and have never been, experiences. The limitless tossings of coins, throwings of dice, and drawing of balls out of bags, have never been executed, and have therefore never been experiences at all; but they

satisfy the conditions nevertheless, for they suppose a series of circumstances in which an exact numerical proportion would obtain between uniformity and non-uniformity, were the experiences actual. They bear the same relation to the experiences of actual life as the lines and figures of the geometer bear to the lines and figures that are actually met with in experience. They are circumstances that are, for the purposes of calculation, assumed to exist; and an exact ratio of uniformity to non-uniformity being postulated, the task of the calculator is to set himself problems in complicated ratios and to reduce them to simple ratios. Having arrived at a simple ratio, he then commonly applies his conclusion to the mental relation, and declares that this ratio accurately represents the degree of cohesion that exists therein; but in this he is proceeding *ultra crepidam.* So long as he confines himself to calculating the numerical relations among phenomena, so long we bow to his authority and accept his conclusions; but the moment he quits his last, and declares that our belief does, must, or ought to exist in that precise ratio, we take our leave of him.

It is not denied, nay, it is admitted, it is proclaimed, that the degree of cohesion of the mental relation, that is to say, the amount of probability that we infer, the degree of expectation that we entertain, with regard to the occurrence of $A+B$, does correspond with the numerical ratio of our experiences of $A+B$ to $A-B$. But it is asserted that, although a quantitative relation does exist between the mental state and the ratio of the experiences, this relation remains always vague and indefinite.

The mistaken application of exact numerical ratios to mental states seems to have arisen in this way: In the vast majority of the actual experiences of life there is no such fixed ratio. There is a general and moderately coherent belief that a red sunset is the precursor of a fine day; but although in many cases our experience has justified the belief which has arisen from it, there is not, and never has been, any exact record of the number of such sunsets which have been followed by fine weather, as against the number which have been followed by wet weather. And similarly with the rest of the experiences of ordinary life. A vague belief corresponds with a vague estimate of the numerical ratio of experiences. It was, therefore, not at all unnatural that the mathematician should consider that, if he could exactly define the numerical ratio of the experiences, he could by so doing exactly define the belief, as in so many of his operations he had succeeded in estimat-

ing a quantity by estimating another quantity of which the first was a function. The error was twofold. It lay, first, in postulating that that is susceptible of exact estimation which is not so susceptible; and, second, in assuming that the numerical ratio of the experiences is the sole factor which determines the degree of belief, whereas it is but one of many factors. These other factors we have now to consider.

The second factor in that constancy in experience which determines the validity of all our inferences is the *frequency* or number of the experiences—the absolute number of the experiences of both $A+B$ and $A-B$, as distinguished from the relative numbers of each. In order to examine the influence of this factor in the experience upon the cohesion of the relation, we must, as in the other cases, suppose the other factors to remain constant.

A man makes for the first time a cross-country railway journey, in the course of which he has to change, with a narrow margin of time, not only into a different train, but on to the lines of a different railway company. In order to eliminate the influence of any other factor, we must postulate that he knows nothing about the practice of either line of railway with respect to the punctuality of its trains. He has not much time for the change, but he arrives at the mid-point of his journey, he leaves his train, crosses to the other station, finds that his second train has not yet arrived, and accomplishes his journey successfully. With what degree of confidence will he anticipate that on a second occasion he will succeed in making the connection? His experience of successfully making the connection is uniform, as a single experience must needs be; but its frequency is minimal. The probability, or cohesion in his mind of the thought, of making the connection, will not be very high. He will have good hope of catching his second train on a subsequent occasion; he will consider it more probable that he will catch it than that he will not; but he will be far from *certain*. Now let us suppose that his second journey is successfully accomplished; his anticipation of success in a third attempt will be distinctly increased; and with every successful repetition of the journey, his confidence in the success of future journeys will receive a new increment—a new, but not an equal increment. His second success will add greatly to his belief in the success of his third; his third success will add considerably to his confidence of the success of the fourth; his fourth success will add appreciably to his

assurance of the success of his fifth; and, with every subsequent successful journey, the anticipation of subsequent success will be increased, but will be increased by a smaller increment; until, by the time that he has successfully made his journey every day for twenty years, he has become almost certain, or as the phrase goes, practically certain, that he will succeed in making the connection; and the increase of certainty that he attains by the success of a new journey has become altogether inappreciable. The effect of the frequency, or perhaps we had better say, of the number of repetitions, of an experience, is to increase by continually diminishing increments the cohesion of the corresponding mental relation; and it should be added that the rate of diminution of the successive increments itself diminishes progressively. That is to say, while the increment added by the fourth or fifth experience is considerably less than that added by the third or fourth, the increment added by the hundred and fourth is not appreciably less than that added by the hundred and third.

If we examine and estimate the degree of belief that exists after a certain number of experiences, we must recognise that it is less than after a number of experiences that is virtually infinite. Even after twenty years of uniform success, the certainty of making the connection between the two trains will be appreciably less than the certainty that an object which presents one side to us has another side remote from us, or the certainty that a sound implies a moving body. Of the latter we say that we are absolutely certain; of the former that we are practically certain. What we mean by these expressions is that we accept the uniformity with a reference not only to its perfection—to the absence of any exception to it—but also with a reference to the absolute number of instances in which it has been experienced. The uniformity is in both cases absolute, but the degrees of certainty are not the same. A uniformity, which has been absolute in a limited number of experiences, breeds a degree of confidence in proportion to the number of experiences in which it has been found absolute; and when the number approaches infinity, the confidence, in limit, becomes certainty. If to both of these degrees of confidence or belief we apply the term certainty, then this term must be qualified to express the different degrees of cohesion that they connote. If the connection between the trains has been attempted but once, and made, then experience of making the connection is indeed uniform, but it is the lowest minimum of uniformity, and the

certainty of making the connection in future is the very lowest minimum of certainty. Commonly it would not be called certainty at all. We should say in ordinary parlance that he regards it as just possible that he will always be successful. But since the practice in psychology is that anyone may call anything by any name that he pleases, I shall call this the lowest degree of certainty, and shall depart from usage so far only as to define the meaning that I attach to the term. By certainty I mean the degree of cohesion of a mental relation, which is produced by uniform experience of the corresponding phenomenal relation; and the lowest degree of certainty is that produced by a single experience of a relation. Each repetition of the experience will produce, so long as the experience is uniform, an accession to that cohesion of the mental relation which I call certainty. This cohesion of the mental relation is, on another aspect, an expectation that future experiences will conform with past experiences. On yet another aspect, it is an estimate of the uniformity with which the phenomenal relation occurs, and I shall consider myself at liberty to use these meanings interchangeably. But the privilege that I shall deny myself is that of applying the term certain, not to the mental state produced by experience of phenomenal relations, but to these relations themselves; or if I do so far conform with custom as to use the same word in two widely different senses, I shall distinguish the second sense by placing the word in quotation marks. I shall call certainty, the cohesion of $a+b$, the mental relation, and "certainty," the uniformity of $A+B$, the phenomenal relation.

After a single experience, we are in the lowest degree of certainty it is true, but we have gained something. We now know that success is possible. We are quite certain, absolutely certain, that success is possible; which is another way of saying that the mental relation produced by the experience, or, in other words, the memory of the experience, is quite coherent. Since we cannot dissolve the memory of the attempt from the memory of its success, and substitute a memory of non-success, we are precluded from thinking that the phenomenal relation never occurs. We are quite certain that it has occurred, and this certainty as to the past compels us to admit possibility in the future. The single experience has done more for us than this. It has enabled us to entertain a probability—a very low degree of probability—that the phenomenal relation is uniform, that the times of arrival and departure of the trains are always such that the journey

can be successfully made. Now this uniformity of occurrence of the phenomenon is sometimes called "certainty" of occurrence, and in this sense we have gained the ability to attach a very low degree of probability to the "certainty" of the occurrence; or as it would commonly be put, we regard it as just possible that success is "certain."

If the connection has been made with uniform success a dozen times, the certainty in the proper sense of the term, the cohesion of the mental relation, is increased with each experience; but it is still low. He has greater confidence—more certainty—of making the connection in future. He has a more assured expectation of success. His estimate of the uniformity of the phenomenal relation is raised. He is more certain that success is "certain"; or as he might put it, he would regard it as probable that success was "certain." My own use of the word probable would be more limited than this, but the use of the term in this sense would commonly be regarded as legitimate.

If the journey has been successfully made every day for twenty years, the cohesion of the mental relation has become very strong, and success is regarded as "practically" certain, or almost certain; and if it is not certain in the degree in which it is certain that sound is due to movement, it is because the number of uniform experiences which produce the certainty in the former case is, if very great, yet limited; while the number of experiences which produce certainty in the latter case is unlimited—is virtually infinite. It would now be said that it is practically certain that success in making the journey is "certain," and quite certain that the relation between sound and movement is "certain."

In the foregoing examples, we have considered the effect, upon the cohesion of the mental relation, of varying numbers of repetitions of uniform experiences. Let us now take the case of experiences that are not uniform—of experiences in which the occurrence of $A+B$ is varied by the occurrence of $A-B$. Before our traveller starts on his first journey, he is almost completely uncertain, perhaps completely uncertain, as to whether he will or will not succeed in making the connection between the trains. His mental relation of sequence is almost completely devoid of cohesion. $a+b$ and $a-b$ are almost equally cohesive or non-cohesive. He has scarcely any belief one way or the other. It is probable that there is some cohesion of $a+b$, for he does start on the journey and make the trial. He makes his first journey, and succeeds. Immediately there is a great accession

to the cohesion of $a+b$; and encouraged by this, he tries a second time. But the second time he fails. On his second journey he finds, when he arrives at the station, that the second train is already gone. Immediately the cohesion of $a+b$ is neutralised by the cohesion of $a-b$, and his mind is thrown back into a state which is in some respects similar to, and in other respects very different from, that in which it was before the first journey was made. Certainty is now abolished, and Probability has taken its place. So long as experiences are uniform, we may speak of certainty, and however few the experiences, yet, so long as they are uniform, we are dealing with certainty, of however low degree. But as soon as uniformity of experience is broken; as soon as experience includes, not only a relation among phenomena, but the negation of that relation; as soon as there is a numerical ratio between experiences of $A+B$ and experiences of $A-B$; so soon certainty disappears and Probability comes into existence; for by Probability is meant the ratio of the cohesion of $a+b$ to the cohesion of $a-b$.

In the case supposed, the two relations $a+b$ and $a-b$ are equally coherent, and the ratio being one of equality, $A+B$ and $A-B$ are regarded as equally probable. The experience of $A-B$ has imported into consciousness not one, but two new relations. It has not only given cohesion to the mental relation $a-b$, but it has rendered possible, and even necessitated, the formation of a relation between $a+b$ and $a-b$. This relation is one of equality, and we say that the probabilities of $A+B$ and $A-B$ are equal. In other words, there has been established a mental relation of similarity between the cohesion of $a+b$ and the cohesion of $a-b$,—a relation that may be symbolised by $(a+b) : (a-b)$. This relation is established; but it has the lowest minimum of cohesion, since it is based upon the lowest minimum of experience. Just as the result of a single experience of $A+B$ was to produce the lowest minimum of cohesion of $a+b$, so the result of a single experience of the ratio of $A+B$ to $A-B$ is to produce the lowest minimum of cohesion of the mental relation $(a+b) : (a-b)$. In other words, although we estimate the probabilities of success and of non-success as equal, yet this estimate has the lowest minimum of certainty. It is extremely uncertain that the probabilities are equal.

Although certainty with regard to future experiences has vanished with uniformity in past experiences, yet even discrepant experiences produce some certainty. While it remains in the highest degree

doubtful whether, on a third trial, he will or will not catch his train; yet of this doubt, of which before experience he was uncertain, he is now certain. Before experience, there was no certainty in his mind as to whether either event was ever possible or was never possible; whether $A+B$ or $A-B$ was "certain" or "uncertain." Experience has brought certainty in this respect. While he is quite uncertain as to whether he will succeed or fail upon a third trial, he is certain that he has succeeded once, and that therefore success is possible; he is certain that he has failed once, and that therefore failure is possible. He is certain that neither $A+B$ nor $A-B$ is "certain"—that neither $A+B$ nor $A-B$ is uniform in occurrence. No continuance of uniformity of success can obliterate from his mind the memory that he has once failed; can so close up the cohesion of the positive relation $a+b$ as to destroy the faint anticipation that he may possibly fail again; can remove a remnant of uncertainty as to the uniformity of $A+B$. Nor could any continuance of uniformity of non-success entirely destroy all hope of success in future. While, before experience, either of the phenomenal relations $A+B$ and $A-B$ were regarded as possibly constant, they are now known to be both inconstant; while $a+b$ and $a-b$ were both potentially indissoluble in relation to experience, they are now both actually dissoluble.

Now let us suppose that our traveller continues to make his journeys with varying success. Every experience of success increases the cohesion of $a+b$, augments the ratio of the cohesion of $a+b$ to that of $a-b$, and so increases the estimate of probability of future success. Every experience of $A-B$ increases the cohesion of $a-b$, augments the ratio of the cohesion of $a-b$ to that of $a+b$, and increases the estimate of probability of future failure. The estimate of probability of success at any time depends roughly, and other things being equal, upon the numerical ratio of experiences of $A+B$ to experiences of $A-B$; and the certainty of this estimate depends upon the absolute number of the sum of both experiences. Supposing that the ratio of experiences of success to experiences of failure is 5 : 1 (and less than this would scarcely justify the traveller in continuing by that route), then the cohesion of $a+b$ is considerably greater than that of $a-b$, and success is regarded as considerably more probable than failure. But if this estimate of success is founded upon but six experiences of both kinds, its certainty is but low. It is uncertain whether the assigned probability is correct, whether the ratio of $(a+b) : (a-b)$ corresponds

with the ratio of $(A+B) : (A-B)$. In other words, the cohesion of the mental relation $(a+b) : (a-b)$ is low. With every increase in the total number of experiences of $A+B$ and $A-B$, the probability, however it may vary with the proportions disclosed by experience, acquires greater certainty, and when the number of experiences becomes infinite, the probability becomes, not certainty, but certain. That is to say, the proportion disclosed by an infinite number of experiences, or what for our purpose is the same thing, the proportions which we arbitrarily assume would be disclosed by an infinite number of experiences, produce a complete cohesion of a certain relation of the cohesion of $a+b$ to the cohesion of $a-b$, or render certain the respective probabilites of $A+B$ and $A-B$.

When, therefore, we say that it is probable (or, as I should prefer to say, somewhat certain) that $A+B$ is "certain," we mean that in a limited number of experiences $A+B$ has been found uniform. When we say that it is certain that $A+B$ is probable, we mean that in an infinite series of experiences of $A+B$ and $A-B$, the experiences of $A+B$ have been more numerous.

What the mathematical calculators of chance mean by "the long run" is an infinite number of experiences; and, in the phenomena with which they deal, it is arbitrarily assumed that in an infinite number of experiences there would be a given proportion between the experiences of $A+B$ and those of $A-B$. The probabilities with which they deal are therefore certain, or are arbitrarily assumed to be certain. But such probabilities are, in practical affairs, so rare, that for the practical purposes of life their calculations are valueless. If, indeed, mankind gained their living by drawing balls out of bags, or tossing halfpennies, these treatises would be as valuable as tables of the strengths of materials to the engineer; but seeing that we very rarely have to deal with infinite series; seeing that most of the experiences on which we have to found our acts are limited in number, and are often limited to a very small number; seeing, therefore, that the probabilities with which we have to deal in the practical affairs of life are not certain probabilities, but probabilities of, for the most part, a very low degree of certainty; the mathematical calculation of chances remains a mere academical exercise of ingenuity, somewhat on a par with that of the country parson, who attained such perfection of skill at the practice of cup and ball, that he was able to catch the ball on the spike a thousand times in succession without a single mishap.

PROBABILITY AND LIKELIHOOD

So far, we have decided that the cohesion of the mental relation, which is established by the process of inference, depends in part upon the uniformity of the experiences upon which the inference is founded, and, when the experiences have not been uniform, it depends upon the numerical ratio of the experiences in which the relation has been present to those in which it has been known to be absent. It has been repeatedly stated that the cohesion of the relation is not wholly determined by these factors, but that there are other factors, whose influence has hitherto been eliminated, by supposing them constant throughout the changes in those factors that have been considered. It remains now to determine the influence of the factors hitherto neglected, for which purpose it will be necessary to eliminate in the same way the influence of those already considered, by supposing them to remain constant throughout the variations of the others.

That imperfect cohesion of the terms of a relation which constitutes imperfect certainty, or uncertainty, is susceptible of many degrees, of every degree between complete or absolute certainty, and that complete uncertainty in which both the positive relation and its negative are equally cohesive or incohesive. We have now to note that the ground, or basis in experience, of the degree of cohesion of the relation, is not always the same. The cohesion of the relation may rest upon one of two modes of experience, both of which have hitherto been confounded under the title of probability; and as soon as this title was attached to the mode of experience, it immediately brought up by suggestion the process of casting dice, tossing halfpence, drawing white and black balls out of urns, dealing cards, and other immoral practices, which then monopolised attention, and kept out of view the other mode of experience, which is in practice much more frequent and much more important. To the cohesion which is founded upon this second mode of experience I propose to give the name of Likelihood, reserving Probability to the special connotation which it has earned by the labours of so many eminent men.

If $A+B$ represent our experiences of a certain relation, and $A-B$ represent our experiences of the negative of that relation, then the proportion $A+B : A-B$ gives $a : b$, the cohesion or Probability of the corresponding mental relation, as already set forth. But supposing

that there is no such experience of numerical relations to appeal to; supposing that this precise A has never occurred before in our experience, then the cohesion of $a : b$, or our inclination to associate B with A, cannot be derived from any numerical proportion. If there has been no experience of A, *a fortiori* there has been no experience of $A+B$ or of $A-B$, and consequently no experience of any numerical proportion between them; and yet we may, upon very good and sufficient and substantial ground, associate a and b in the relation $a : b$, and declare that this relation is—not Probable, but—Likely.

A young man consults me on account of languor and liability to fatigue upon slight exertion. Upon inquiry I find that he has lost weight, that he has had an occasional night sweat, and that he has had a slight cough. I am at once thrust upon the likelihood that he is consumptive; but the cohesion in my mind, between this group of symptoms and tuberculosis, does not rest in the least upon any numerical proportion between the number of times that they have been in experience associated and dissociated respectively. I have seen innumerable cases in which these symptoms were dependent on tuberculosis, and I may never have seen a case in which the coexistence of all four was dependent on any other cause; but yet I am in doubt. My doubt arises from no experience of $A-B$,—from no experience of cases in which these symptoms existed in the absence of consumption, even if I have had experience of such cases. It arises from *imperfection in the resemblance* of this A to the other A's which I have in experience found associated with B. In other words, it is not because $A-B$ is equally frequent with $A+B$ in experience, but because I am not sure that this A which appears to be A really is A. His languor and fatigue I cannot measure. His loss of weight is very small. His night sweats have been few, infrequent, and slight. His cough he had forgotten until I questioned him closely about it. The doubt arises in my mind, not from any interruption of the constancy in the association of this group of symptoms with tuberculosis, but from an insufficiency in the resemblance between the symptoms which this patient presents and the symptoms which are constantly associated in experience with tuberculosis. This resemblance is so slight, that I am by no means sure that the patient is consumptive. I say that there is some probability that he is consumptive, but what I mean, and ought to say, is that there is some likelihood that he is consumptive.

Another patient dies under my care from progressive asthenia for

which I can find no explanation. He takes to his bed, and gets weaker and weaker until he dies, and I can find nothing in his antecedents or in his physical signs to account for his weakness nor for his death. But in the last few days of life I notice, or think that I notice, that there is a shade about his hands and face as if they were a little sunburnt, and I say that it is probably (I mean likely) a case of Addison's disease. In such a case, I do not base my estimate of probability upon the number of times in which this mode of death has been associated with disease of the adrenals, and the number of times in which it has not been so associated. I base it entirely upon the degree of likeness of the symptoms presented by the patient to the symptoms of Addison's disease; and the closer the resemblance, the greater is the likelihood that that disease is the cause of death.

Or, I am going for a walk, and I hesitate whether I shall take a stick or an umbrella, and finally decide that "most likely it will rain," or that "it does not seem likely to rain," and take the one or the other accordingly. In thus estimating the likelihood of rainfall, I am not influenced in the least by my experience of the proportion which the number of rainy days bears to the number of fine days, nor am I influenced by the proportion of times, in which rain has followed such a sky and barometer as now obtains, to the times in which it has not followed, for just such a combination has never been experienced before. What influences me, and determines for me the likelihood or unlikelihood of rain, is no numerical proportion, but the degree of resemblance of the meteorological conditions which now exist to those conditions which have in the past been followed by rain. If the resemblance is close, then I am determined that rain is likely; if the resemblance is distant, then I am determined that rain is unlikely; but in no case am I determined by numerical proportion, and therefore I speak of my expectation not as probability, but as likelihood.

EXPECTATION

From what has already been said, it will have appeared that inference is in every respect intimately dependent upon memory. In every inference there is, patent or latent, an appeal to memory, and it is upon the result of this appeal that the validity of the inference depends. The inferred relation is in every case established by its

assimilation to a relation which has been previously experienced, and to say this is to say that it is assimilated to a remembered relation. Memory is, therefore, an integral part of inference, and without memory there could be no thought. So intimate, so necessary, is memory to inference, that, at its origin, inference is but an aspect of memory. It arises out of memory by the concentration of attention upon one part of the process of remembrance. It will not be surprising, therefore, if we find, as we shall find, that the remaining conditions, which determine in our minds the cohesion of an inferred relation, are the same as those that determine the revival of a relation; and it will be apparent already that the element that we have already considered—the frequency of repetition in experience of the relation, which determines both the degree of certainty and the probability of an inference—is the same as that which determines so largely the spontaneity of the revival of a memory, as well as in part its faithfulness and its endurance.

Under its remaining aspects, the cohesion of an inferred relation may be called the Expectation of the constancy of the relation. It is true that Expectation may, if we please, be held to include both certainty and probability, but it will be convenient to limit its meaning to such portion of the cohesion of the mental relation as is determined by the factors in the experience that have now to be considered; viz. the recentness and the vividness of the experience, and the state that consciousness was in at the time of the experience.

Recentness. Other things being equal—the other factors which contribute to the determination of the cohesion of the mental relation being constant—the Expectation of a relation is determined by the recentness with which it has been experienced. Supposing that the probability of an event, in the sense in which the term is here used, viz. the degree of belief, determined by the ratio of experiences of $A+B$ to $A-B$ as already explained—has attained to a considerable degree of certainty;—suppose, for instance, that I have travelled for a good many years by a given train, and have found that in a given proportion of occasions the train has been late. On a particular occasion it is more than usually important that I should arrive punctually at my destination; and it happens that on the previous day the train was late. My expectation that the train will be late this morning is greater if it was late yesterday than it would be if the train had been uniformly punctual for the last three weeks. It must, of course, be supposed that my experience of the unpunctuality of the

trains has not been such as to render the probability either greater or less after a single occasion, or a series of occasions, of either punctuality or unpunctuality. Or suppose that a man who has for years driven his horses without meeting with an accident, is at length run into and injured, and his carriage broken up. The next time he drives out, his expectation of meeting with another accident is considerable. He is nervous. He is apprehensive. He sees in every approaching cart a source of danger and of anxiety. As time goes on, his apprehension —his Expectation—of another accident diminishes, and at length becomes minimal; but then he meets with another accident; and the same attitude of mind is reproduced, and undergoes the same change as before with the lapse of time. Or, take the case of a mining prospector who is driving an adit through a hill, and from time to time passes through a leader of quartz. In one of these he finds a good show of gold; and his expectation of finding gold in the next vein, or in some other part of the same vein, is raised to a considerable height. As time goes on, and he finds none, his expectation gradually diminishes, to be raised again whenever he finds another show of gold; and in each case, the further the successful event recedes into the past, the less is the expectation of a new one. In this case it is less easy than in the previous cases to eliminate the effect of probability, because every foot of barren ground passed through is an experience of $A - B$ and increases the ratio of experience of $A - B$ to those of $A + B$, thereby diminishing the probability. But we may eliminate this influence by supposing that, immediately after a rich find, the machinery breaks down, and a long interval must elapse before the broken part can be replaced. After months of waiting, the miner is in a position to resume operations, but in the meantime his hopelessness has subsided. He still expects to find good ore beyond the point that he has reached, but his expectation is distinctly less sanguine than it was immediately after the rich find was made. He will admit, if questioned, that his excitement has subsided in the interval, and if you talk to him now, you will find that while he is still sanguine, he is distinctly less confident than he was at first; and the longer the interval that elapses before operations are resumed, the less confident is his expectation of fortune.

Vividness or Impressiveness. Other things being equal, the cohesion of a relation varies as the vividness of the experiences on which it depends. If, in the course of a drive, a trifling collision occurs, and the

damage is limited to a few scratches on the paint, the occupants pursue their way with equanimity, their expectation of future collision being scarcely increased by the occurrence. They tell the coachman to be careful for the future, and drive on without anticipating a second accident. But if the collision is serious—if the carriage is smashed and the occupants badly shaken—the effect upon their expectation of a future collision is very much greater. So apprehensive are they of a second accident that they dare not even accept the loan of another carriage to take them home. Nothing will induce them then to run the risk of another accident, so formidable does the risk appear. They insist upon walking home. Several proverbs testify to the cohesion of a relation which has been determined by a highly impressive experience. "The scalded dog fears cold water." "He who has been bitten by a snake fears a rope." The cohesion of the relation is so great that it leads to the establishment of a cohesive relation between terms whose resemblance to its terms are but partial and superficial. The man who wins £1,000 at a *coup* at Monte Carlo will have a greater expectation of winning more than if in the same time he had won but a single Napoleon. Illogical? Doubtless. Unwarranted by the theory of chances? Doubtless. But we are not now dealing with probability, nor with the processes of formal logic. We are endeavouring to ascertain, not what ought to determine expectation, but what actually does in practice determine it; and the objector must direct his objection, not to the warrant for the inference, but to the question whether in fact the expectation will be greater in the one case than in the other; and should he deny the fact, then I shall beg him to deny it not from an imaginary, but from an actual transference of himself to the position of the gambler. I do not mean that he should rush off to Monte Carlo and try his luck, but that he should endeavour to remember the relative degrees of his expectation after two experiences each equally probable, but one much more favourable to him than the other.

To go out in uncertain weather without an umbrella is, in the opinion of many, to invite a downpour of rain. The expectation of rain is increased by the want of the umbrella, and this expectation is embodied in a semi-proverbial saying. The sole ground of the increased expectation is the greater impressiveness of the experience of rain in the absence of the umbrella than of rain with its shelter. It will scarcely be denied that, among schoolboys and persons of similar

mental calibre, there is a stronger expectation that a fallen piece of bread and butter will be found butter side down than butter side up, and the only possible ground for this superiority of expectation is the greater impressiveness of the one event than of the other.

Finally, the degree of cohesion of the mental relation, all other conditions being supposed to remain constant, varies with the constitution, both permanent and temporary, of the person who is subject to the experience. We shall find in dealing with memory, that the faithfulness, endurance, and revivability of memories are largely determined by the condition in which consciousness was at the time of the acquisition of the state now remembered, and, having regard to the large share which memory takes in the process of inference, it will not be surprising if we find that the result of the inferential process is to some extent determined by the condition of consciousness at the time the inference was arrived at.

That the degree of expectation depends largely upon the permanent trend of consciousness scarcely needs demonstration. When the same somewhat speculative investment is offered to two people, whose experience of the results of investments has been about the same, one will accept the offer, while the other will decline it, the action being determined by the expectations which they severally entertain of the result of the investment. This man, who is of what is called a "sanguine temperament," that is to say, whose mind is naturally prone to expect favourable experiences, will draw, from the evidence before him, an inference that success is more to be anticipated, is more likely to result from the venture, than failure. That is to say, of the two mental relations, the one of the sequence of success and the other of the sequence of failure upon his act, the former will be the more cohesive. The other man, whose mind is differently constituted, will see the matter as we say, in a different light; to him the sequence of failure will be the more cohesive, and he will expect that if he invests his money in the enterprise, it will be lost. Of course, these several anticipations may be, and often are determined, sometimes solely, sometimes largely, by previous experiences of the results of investments, and in such cases the degree of expectation will be determined by those factors which have already been considered under other headings; but it will scarcely be questioned that, after approximately the same experiences, one man will be sanguine of success, while another will be apprehensive of failure—that among the factors

which determine the degree of expectation of an event, the innate sanguineness or apprehensiveness of temperament plays a conspicuous part. The records of explorers, of campaigners, of adventurers, of all who have taken part in associated endeavours to attain a common and uncertain end, show beyond question that, upon the same experience, different men will form widely different expectations of the results of the enterprise upon which they are engaged; and although it is admitted and asserted that a part of this difference depends upon differences in the previous experiences that they have severally undergone with respect to other enterprises, yet such differences in experience, it is submitted, do not account for the whole of the difference in the expectation. A residuum remains which cannot be explained except upon the hypothesis that there are, in different men, different directions in expectation; some being more, and some less, prone to expect favourable issues from circumstances.

Nor are these different tendencies in expectation limited to such circumstances as involve the favourableness or unfavourableness, to the expector, of the expected event. They are also exhibited in the expectation of circumstances which are neutral in so far as the welfare of the expector is concerned. Of twelve men who have to decide, upon the same evidence, as to the guilt or innocence of a thirteenth, some will be assured of guilt, some of innocence, and in the minds of a third group the relations of guilt and of innocence to the accused will be equally cohesive or incohesive. Admitting that the tendency to take the one view or the other will be largely determined by the previous experience of the individual juror, as to the integrity or the fallibility of his fellow-men; yet in this, as in the previous cases, there is a considerable residuum of difference that is not thus to be accounted for, but that depends upon the original native constitution of his mind, which renders him prone, on the one hand to suspicion and the attribution of evil motives to others, or on the other to confidence and a higher estimate of general rectitude. One person, upon missing an article of value, concludes at once that it has been stolen; another, under the same circumstances, infers that it is mislaid; yet the first has not necessarily suffered more losses by theft than the second, and may even have suffered fewer. In such a case, and such cases are common, there is no explanation, supposing the other factors already considered to be constant, except that of different tendencies innate in the mental constitution of the different individuals.

In addition to the influence which is exercised upon the cohesion of the relation by the permanent cast of the mind in which the relation is established, a further influence is exercised by the temporary variations in the general trend of consciousness at the time the relation is revived. We are always more buoyant and hopeful in the morning than in the evening, and the cohesion of those relations which refer to events affecting our own welfare is influenced accordingly. An expectation of benefit, which we should not venture to entertain in the evening, and which would appear preposterous in the small hours of the morning, if we were then to wake and think about it, would seem quite justifiable at breakfast-time. The sombre, inelastic state of mind which is so well known to accompany dyspepsia, and often to follow influenza, has a powerful influence upon the cohesion of all relations of this class, quite apart from the character of events experienced. Less marked, but perceptible enough to the observing eye, are fluctuations in the expectation of events in which our own welfare is not, or is but indirectly concerned, dependent upon fluctuations in the general trend of consciousness. The most confiding of men is not at all times equally confiding—has at times his suspicions of the purity of the motives of his fellow-men; the most suspicious has his moments of confidence—moments in which, from want of practice, he is apt to bestow his confidence unwisely, and by the result to be more confirmed than ever in his attitude of suspicion.

The cohesion of the mental relation, or the degree of belief, depends, therefore, not alone upon the numerical proportion of the experiences of $A+B$ to those of $A-B$, but upon a number of other factors; and thus it is that the degree of belief, or of expectation, which we actually entertain with regard to an event, seldom corresponds, even in the vague and general manner in which alone it can correspond, to the numerical ratio of the experiences in which the event has been present, to those in which it has been absent. Tell a man, who has recently been in a railway accident, that the chances of his encountering a second are so many millions to one as to render him practically secure; and prove it to him by the most elaborate and unimpeachable algebraic equations. Will that prevent him from expecting at every jolt that the train is going off the line? Will it prevent him from jumping out of his seat as it goes over the points? Tell the jury, if you have the face to do so, that the witness is known to speak the truth on an average nineteen times out of twenty, and prove it to them by a cloud of witnesses of

similarly qualified veracity, and how many of the jury will you induce to believe that the present occasion is one of the nineteen, and not the twentieth? According to the doctrine of chances, they all ought to believe nineteen-twentieths of what he says; or they should believe that it is nineteen to one that he is telling the truth. As a matter of fact they will one and all regard his evidence as worthless. They will flout the numerical proportion, and say that if he is known to have perjured himself on any previous occasion, his evidence now is utterly unreliable. Let a company promoter prove beyond dispute that the chances are only 100 to 1 against the investor of £1 making £1,000 out of the venture; how much of his capital is likely to be subscribed? Show, if you can, to the dyspeptic mortgagor that it is 125 to 13 that his mortgagee will not foreclose until the funds are available to pay him off; will it alter one jot his settled conviction that he is a ruined man? No. Our beliefs are not wholly founded—are but in very small degree founded—upon the numerical doctrine of chances, even in the cases in which this doctrine is strictly applicable. They are determined by a number of factors, of which sometimes one and sometimes another is the more potent, and of which the numerical ratio of the experiences is usually a very subordinate one.

TRUTH

"When he (Goethe) is told such a thing must be so, there is immense authority and custom in favour of it being so, it has been held to be so for a thousand years, he answers with Olympian politeness, 'But is it so? Is it so to *me*?'"

MATTHEW ARNOLD.

We are now in a position to examine the criterion of certainty which was assumed provisionally at the opening of this discussion, viz. that those beliefs are certain whose terms we cannot dissociate. The examination of this position involves an investigation of the problem or problems that are universally regarded as the most obscure and recondite in the whole range of human speculation. The question of Pilate must have been asked by every speculative mind from the dawn of intelligence down to his own day; and has occupied the highest faculties of the greatest minds from his day down to ours, with the result that no answer that has yet been given has found general acceptance. In the face of this ill success, the proper attitude of a mind, conscious of its inferiority to the giant intellects that have grappled with

the problem, would seem to be an acceptance of its insolubility, or a patient expectance of the day when some intellectual Titan shall lay it to rest for ever. Such an attitude would, however, be incompatible with the spirit of restless and eager endeavour which is so characteristic of the present age; and moreover is discredited by the fact that while the problem has never received such a complete solution as has given general satisfaction, it is undeniable that each endeavour does appear to advance our progress towards a solution. It may be that the line of our approach is an asymptote, and that its actual attainment is for ever beyond our reach; but none the less is it incumbent upon every worker to do what in him lies to add to the progress, be it by never so little.

Two commanding hypotheses have long held the field against each other—Rationalism, which supposes a natural tendency in the mind to think what is true, an innate tendency of thought to conform with things, and Empiricism, which denies any tendency or quality or capability of mind that is not derived from experience, and regards whatever conformity of thoughts with things that may exist as having been produced by the application of thoughts to things, and the action of things on thoughts. These hypotheses have, to a much larger extent than seems generally acknowledged, been reconciled by the great solvent of puzzles, the theory of Evolution. According to this hypothesis there is, at any rate in some respects, an innate tendency of thought to conform with things, a tendency which is antecedent to any experience of the individual in whom it occurs; but this tendency —this form which thought tends to assume—is itself the product of experience, acting, antecedent to the life of the individual, upon the long line of ancestry stretching backward to an indefinite past. By the action and reaction between an organism and the circumstances in which it lives, the structure of the organism is, in successive generations, moulded into harmony with the circumstances—moulded not only in respect of its teeth and claws, its legs and wings, its fur or scales or feathers, but in its habits, its "instincts," it means of receiving motion and its appliances for emitting motion, the structure as well of its nervous system as of its alimentary or tegumentary system. The shorter the time, the fewer the generations during which a line of organisms has been subject to any set of conditions, the less indelible is the modification of structure which answers to that set of conditions; the longer the line of continuous ancestry upon which any

set of conditions has acted, the earlier in the process of development does the structural modification answering to that set of conditions appear, the more ingrained and indelible does it continue, the less easily is it lost. If, therefore, man has, in the course of unimaginable ages, developed from a monad, the ancestry of any individual man have, for that unimaginable period of time, been subject to conditions of Space, Time, Resistance, etc., and consequently the answering modifications of structure have become so ingrained, are attained at so early a stage of development, that at birth they are already advanced in organisation, and are therefore antecedent to experience in any individual. Thus it occurs that after a very little aimless sprawling the chicken and the colt are able to stand and walk; and that the human infant, at a period earlier than memory can recall, acquires definite concepts of Duration, Extension, and Resistance.

Reconciliation of Rationalism with Empiricism supplies, it would seem, a conclusive rejoinder to Mill's chief objection to Spencer's test of truth, viz. that we have no right to accept, as out test, the inconceivability of the negative of a belief, because this inconceivability admittedly rests upon experience, and instead of accepting the inconceivability of the negative, we ought to go back and rest the belief upon the experience itself. But if the experience is not all our own, but a vast preponderance of it is the experience not of ourselves, but of our ancestry, this is a thing that we cannot do. We can know the experience only by the organisation that has been produced under its influence, and that we have inherited, and this organisation is known to us only by its effect—by our inability to form mental relations inconsistent with it. This reasoning seems unanswerably cogent, but it does not commend itself to Mill. "These remarks [on the superiority of the direct appeal to experience] do not lose their force even if we believe, with Mr. Spencer, that mental tendencies originally derived from experience impress themselves permanently on the cerebral structure and are transmitted by inheritance, so that modes of thinking which are acquired by the race become innate and *a priori* in the individual, thus representing, in Mr. Spencer's opinion, the experience of his progenitors, in addition to his own. All that would follow from this is, that a conviction might be really innate, *i.e.* prior to individual experience, and yet not true, since the inherited tendency to accept it may have been originally the result of other causes than its truth."

In this last sentence of Mill's we seem to get the key to his difficulty.

When he speaks of a conviction being innate and yet not true, etc., it seems that by truth he means *noumenal* truth; that is to say, what he denies is that our convictions, however indissoluble, are accurate copies of the relations among noumena, and it seems to me that the greater part of the misunderstanding between Mill and Spencer rests upon the different meanings carried by the word "truth." For the present, therefore, I will discard this word and adhere as hitherto to the word "conviction." Dealing with this term alone, we shall find ourselves upon exceptionally firm ground, for we can rest our demonstration upon a premiss which is accepted by both the disputants in this controversy as well as by every other thinker who has dealt with the subject. This is the acknowledgment that consciousness cannot be in two contradictory states at the same time. As Mill puts it: "Belief and Disbelief are two different mental states excluding one another. . . . Light and darkness, sound and silence, motion and quiescence, equality and inequality, preceding and following, succession and simultaneousness, any positive phenomenon whatever and its negative, are distinct phenomena, pointedly contrasted, and the one always absent when the other is present." Spencer puts the same doctrine in the following way: "When remembering a thing as in a certain place, the place and the thing are mentally represented together; while to think of the non-existence of the thing in that place implies a consciousness in which the place is represented but not the thing. Similarly, if instead of thinking of an object as colourless we think of its having colour, the change consists in the addition to the concept of an element that was before absent from it—the object cannot be thought of first as red and then as not red without one component of the thought being totally expelled from the mind by another. The Law of the Excluded Middle [? Principium Contradictionis] . . . formulates a certain absolutely constant law, that the appearance of any positive mode of consciousness cannot occur without excluding a correlative negative mode; and that the negative mode cannot occur without excluding the correlative positive mode: the antithesis of positive and negative being, indeed, merely an expression of this experience."

If by certainty we mean the cohesion of a mental relation, or as it may perhaps be more accurately put, the cohesion of the terms of a mental relation in that relation, then the test of certainty is indisputably the behaviour of the relation under the trial of its cohesion. If

we make the maximum effort to dissociate the terms from that particular relation, and fail to do so, we must accept the relation as indissoluble, for indissoluble we find it; and our acceptance of its indissolubility is merely the recognition that consciousness cannot be in two contradictory states at the same time. The inconceivability of the negative of any proposition is, and must be, therefore, our warrant for accepting that proposition as *certain*. But are we on that account to accept it as true? This must depend upon what we mean by truth. If by truth we mean that which we regard as certain, the question is answered. The whole of this controversy seems to me to involve the assumption that there is a higher degree of certainty than certainty itself—that not only is there, over and above the truths that are truths *to us*, a noumenal truth, but that this noumenal truth is apprehensible by us. The question of Pilate is at the bottom of the whole controversy. What is truth? What do we mean by truth? If we mean that which is true *to us*, that which we are compelled by the constitution of our minds to accept and believe, then our answer must undoubtedly be, That of which we cannot conceive the negative;—that relation which upon trial we find to be indissoluble.

But Spencer goes further than this. He maintains that the indissolubility of a mental relation, provided that the relation is really indissoluble and is not merely mistakenly supposed to be so, proves not merely that the environmental relation which answers to it is true to us, but that it is absolutely true;—noumenally true; proves not only that we are obliged to accept it,—that it is true in relation to us,—but that it is true in itself, or out of relation to us. It is, however, an integral part of Spencer's doctrine that what is thus affirmed to be an absolute noumenal relation is not the same as the mental relation, or similar to the mental relation. All that is affirmed of it is that to every truly indissoluble mental relation there corresponds a permanent noumenal relation, the nature of which, as of noumena in general, is for ever inaccessible to us. Spencer's position is thus diametrically opposed to Idealism, insomuch that he claims, and, as it seems to me, successfully claims, that noumenal existence is necessarily postulated in every thought, as well of the Idealist, as of the most uncompromising Realist; and that the former cannot even state his position without tacitly assuming that very noumenal existence which he formally denies. On the other hand Spencer differs from the Realist in declining to suppose that the relations among noumena bear any necessary simi-

larity to those among phenomena. All that he claims is that indissolubility in mental relations indicates permanence in the corresponding noumenal relations.

To this it is objected by Mill that many mental relations which were at one time supposed to be indissoluble have subsequently been found to be dissoluble, and that therefore the mere indissolubility of a mental relation is no indication of any permanence in the noumenal relation with which it corresponds; but it is contended by Spencer, per contra, that such mental relations, though supposed to be indissoluble, were not really so, as was proved by the event, and that, in spite of their failure to endure, there are mental relations that are truly indissoluble, and that with these there do correspond permanent noumenal relations. This, then, is the position that we have to examine.

There is no doubt that the dissolubility of our mental states is continually undergoing modification. The relation in the mind of a savage between the fall of a tree upon his hut and the action of some fetish or deity, is probably quite indissoluble. It is probable that he cannot imagine the one event except as due to the other. That every material object will fall downwards if not prevented, is a relation of sequence which, to many people, is quite indissoluble. That the colour of an object is on the surface of the object is a relation that was to all of us at one time indissoluble, and that still remains indissoluble in the minds of most men. Indeed, the whole progress of knowledge throughout the ages may be regarded from one aspect as a continuous process of dissolving of relations previously indissoluble, and we are therefore justified in looking with suspicion upon the assertion that there are any relations that will not ultimately be found to be dissoluble, and with equal suspicion upon the assertion that those relations that we do find indissoluble represent permanent noumenal relations.

The rejoinder to this argument is that those relations which were supposed to be indissoluble, but were subsequently found dissoluble were not, so long as they were supposed to be indissoluble, clearly represented in the mind; and that if they had been, and as soon as they were, clearly represented, they were at once found to be dissoluble. Moreover, that there is a residuum of relations that when clearly represented are indissoluble, and that these, and these alone, are the reliable tests of absolute truth.

Now, with regard to the instances brought forward by Mill as

instances of relations that were indissoluble and have since become dissoluble, the explanation, that they are indissoluble so long only as the necessary conditions of indissolubility were not observed, seems to me to apply completely. These instances are the antipodes, sunrise, and gravitation.

Till a late period in the history of the world, the existence of antipodes was denied on the ground that it was inconceivable, and since by hypothesis the inconceivability of the negative proves the truth of the positive, the antipodes cannot exist; but they do exist. Hence the hypothesis is false. It seems strange that this instance should have commended itself to Mill as crucial; but as it did, it is worth examination, and it will be found open to a double objection. In the first place, it is manifest that the antipodes was not clearly represented in the mind. It was represented from the point of view of a spectator who was standing on his head. The spectator imagined himself transferred to the antipodes with his head and feet retaining the same relation to a fixed line in space as that in which they stand on this side of the earth. He imagined himself occupying an independent position in space; detached from the earth, which was above him, with the trees growing downwards towards him, the houses projecting downwards, the men and beasts walking about above him, and their weights acting not towards the earth, but away from it; and this state of things he called inconceivable. But in this he was doubly wrong. He was wrong not only in placing himself in imagination in an inverted position, and so seeing the whole state of things from the wrong point of view; but he was wrong also in speaking of the antipodes as inconceivable. It is quite clear that what he meant was that they were unbelievable. The conception is formed readily enough, but when formed the relation will not hold together. We cannot, if we so represent the state of affairs, keep the antipodeans from falling off. It is strange indeed that Mill, who rightly attached so much importance to the distinction between inconceivability and incredibility, should have confused them in so obvious a case as this.

When the relative dimensions of the earth and the sun were conceived as they appear to the unaided senses, it probably was inconceivable that the setting of the sun could be due to the motion of the earth; and when the heliocentric hypothesis was first suggested, the movement of the earth remained incredible to most minds and inconceivable to many. But when Mill affirms, with reference to this particular

instance, that a thing may be perfectly believable and yet may not have become conceivable, he strains the use of the word belief to cover a meaning that cannot, in my opinion, be legitimately brought under it. It is possible to repeat in words that we can believe a thing that we cannot conceive, but if we translate the expression into the mental processes for which it stands, it signifies that there is a considerable degree of cohesion in the mind between terms that cannot be brought together at all! that two terms which cannot by any effort be brought into a relation may yet be and cohere in that relation. It is astonishing that Mill could aver that we can believe to be true a concept that we cannot even form. An unformed concept is a blank. It is a footless stocking without a leg; a knife that has neither blade nor handle. It is nothing. How, then, can it be believed? We can *say* that we believe it, as we can put into words all kinds of propositions to which there are no answering thoughts in our minds; but that is a very different thing from having in the mind a relation of a certain degree of cohesion, which is what is meant by a belief. However, passing that, let us look at the geocentric notion as an instance, which Mill regards as crucial, of a relation whose negative was inconceivable and yet which had to be abandoned as not corresponding with the facts; the question is, Was it so clearly represented in the mind as to justify the averment of its indissolubility? I think it clear that it was not. It seems manifest that if the relative positions of any two bodies *A* and *B* vary, we can conceive that *A* remains stationary while *B* moves, or that *B* remains stationary while *A* moves; and that although *A* may be a body only a yard in diameter, while *B* is a body of indefinitely enormous size, the alteration of position can be conceived as due to the movement of *B*, though less readily than it can be conceived as due to the movement of *A*. What the opponents of the heliocentric theory found with regard the movement of the earth, was not, I imagine, that it was inconceivable, but that it was unbelievable, and here again I think that Mill has fallen into the same error as in the previous case and confused the very terms whose confusion he is so solicitous to avoid. Incredible the relation was, no doubt. Maximally cohesive, in the sense that it was not sundered, we must admit. But that it *could* not be sundered we must deny, for it was open to the ancients as it is open to us, to bring it under a wider and more general relation—the relative movement of two bodies—which would have enabled them to dissociate its terms in thought, even though they were

still unable to dissociate them in the realm of experience—to believe in the dissociation. In this case, therefore, the indissolubility of the relation—the inconceivability of its negative—is illegitimately assumed, since the proper test has not been applied; the necessary condition of validity had not been complied with.

The third of Mill's "most marked instances of propositions now known to be false or groundless, but whose negative was once found inconceivable," is stated to be that gravitation may exist without an intervening medium; but it is clear from the text that there is a clerical error in this statement. What Mill regards as a proposition now known to be false or groundless is not that gravitation may exist, but that it cannot exist without an intervening medium, for this is the position that was held by Newton with regard to gravitation, and whose negative was deemed to be inconceivable by the philosophers of his and of subsequent times. With regard to this instance, it is incorrect to say that the proposition is false or groundless, for it has certainly not been proved that gravitation can be exerted in the absence of an intervening medium. That it exists in the absence of a sensible medium was as well known to Newton and his immediate followers as to ourselves. What he could not conceive was that one body could establish a pull upon another in the absence of any medium connecting them—in the absence of anything that could take the place of the string or rod that we spontaneously associate with the notion of one body pulling upon another; and this, according to Spencer, we are still unable to conceive. "If an astronomer avowed that he could conceive gravitative force as exercised through space absolutely void, my private opinion would be that he mistook the nature of conception. Conception implies representation. Here the elements of the representation are two bodies and an agency by which either affects the other. To conceive this agency is to represent it in some term derived from our experiences—that is, from our sensations. As this agency gives us no sensations, we are obliged (if we try to conceive it) to use symbols idealised from our sensations—imponderable units forming a medium." But this assertion is considered by Mill to be one of the most startling that he has ever met. "What other sensation," he says, "do we need than the sensation of one body moving towards another? The elements of the representation are not two bodies and an agency, but two bodies and an effect; viz. the fact of their approaching one another. If we are able to conceive a vacuum, is there any difficulty

in conceiving a body falling to the earth through it?" This seems to miss altogether the point under discussion. What it is alleged that we cannot conceive is not the fact of the body falling to the earth, but the nature of the means by which this fall is brought about. What Spencer refers to as giving us no sensations is not the movement of one body towards the other, but the connection between them to which the movement is due. What is alleged to be inconceivable is not the fall of a body through a vacuum, but the exertion of gravitation through a vacuum; and although the fall of a body implies the existence of gravitation, there is surely a sufficiently clear distinction between the fall of a body and the means by which the fall is produced,—between the movement of a locomotive and the expansion of the steam which produces the movement,—between the movement of a bullet and the explosion of the powder which propels it. So long as we concentrate our attention upon the movement itself, without taking account of the "agency," means, or influence which produces it, so long we are able to conceive it taking place through a vacuum; but as soon as we try to think of how the body is made to move, of how one body acts upon another at a distance so as to produce a movement in it, we find that we must postulate an intervening medium—a string of some kind connecting the one with the other.

Although, however, the verdict must be given to Spencer rather than to Mill upon these subsidiary issues, it seems to me indisputable that each individual must finally accept as true for himself those relations which he finds upon trial to be indissoluble. It is better, no doubt, that they should be clearly represented; and the more clearly they are represented, the more likely it is that conduct founded upon the belief that they are true will be efficient; but clear or obscure, the relation which is found upon trial to be indissoluble is inevitably true for the mind in which the trial is made.

"But this," it may be said, "is narrowing the meaning of the word 'truth' to an unjustifiable degree. Surely there is a sense in which a relation is true in itself, irrespective of the minds which entertain it. To Sir Matthew Hale and his contemporaries witchcraft was true. But for all that, it was never true in fact. The wretches who were punished for witchcraft never did in fact possess the powers which they were supposed to exercise, and the whole fabric of superstition was, in a very proper sense of the word, untrue. If the meaning of 'truth' is to be limited to the sense here attached to it, then the delusion of the

lunatic who believes that his legs are made of glass is true, since in his mind the relation is indissoluble. Thus to limit the meaning of 'truth' lands us, therefore, in absurdity."

The objection is cogent, but it points, I think, not to any fault in the meaning that ought to be attached to the word "truth," but to an error in Spencer's criterion of dissolubility. A relation which is indissoluble must still be regarded as true by the mind which fails to dissolve it; but the test of dissolubility, or the necessary antecedent condition to the test is not, I think, the clearness with which the relation is represented, but the condition that *conduct founded upon the belief fails to bring us experiences which render the relation dissoluble.* This is the test of what we regard as objective truth, or truth in itself—as relations that are true absolutely and out of relation to the conceiving mind. When we find in our minds an indissoluble relation, such as that between motion and a moving body or between resistance and extension; and when we find that conduct founded upon the belief that motion is never separate from a moving body, and that resistance is never divorced from extension, brings no experiences that enable us to dissolve the mental relation, then we regard the relation as objectively true; as founded upon and corresponding with a permanent noumenal relation. But these relations are still true for us only. Although to us they are indissoluble and therefore true, we may not predicate that to other intelligences they are not dissoluble; nor may we predicate that to our descendants they will not rank in the same category as the belief of Sir Matthew Hale and his contemporaries in witchcraft ranks for us.

When I say that the clearness of representation of the relation is not the necessary antecedent condition to the test of dissolubility, I by no means intend to disparage the importance of this condition. We must take care, before we assert that a relation is conceivable, that its terms are actually brought before the mind in that relation; before we assert that a relation is inconceivable we must be sure that its terms are actually represented in the mind severed from the relation. It is so easy to put together words which express inconceivable propositions; and it is so much our habit to deal with words without translating them into the mental relation for which they stand; that an inconceivable proposition may easily be, and often is, asserted by one and accepted by others, in good faith, and without any realisation of its inconceivability. We think in words as the mathematician calculates

the first quality is never in our experience divorced from the second, we do know. Of that we are certain. That we must accept. That is true—to us. It is true, so far as the limits of our experience extend. It is true to all men in all places at all times. Conduct founded upon the belief in its truth never brings to us any experience conflicting with its truth, or weakening in the slightest the cohesion of the relation. We have therefore the highest warrant attainable to us that the relation is noumenally true; but this warrant may, for aught we know, be insufficient. Sufficient or insufficient, we have no alternative but to accept it. It is true for us. We are precluded from doubting it until an instance to the contrary occurs in our experience; and although we can put together the form of words expressing this supposition, we cannot conceive such an instance to be possible. We are now, it seems to me, down on the adamantine bed-rock of knowledge, and no mental dynamite that we can use will penetrate a hair's-breadth into its substance.

The conclusion at which we have arrived is, then, that if a mental relation is really indissoluble; if it is clearly represented, and cannot be brought under a wider relation which is itself dissoluble; if conduct based upon its constancy never brings upon us an experience which contradicts it—it is true. It is true in the sense that we cannot but accept it; that we are precluded from entertaining any doubt of it; and that we have, for what it is worth, the warrant of universal experience for supposing that it is noumenally true. Beyond this I think we cannot go. Whether there is any real difference between accepting a relation as true to all mankind in all ages and in all circumstances, and believing that it is noumenally true, is not I think of practical importance. The importance of belief is its influence upon conduct; and in the influence that they respectively exert upon conduct there is no appreciable difference between that which is universally true and that which is noumenally true.

CREDIBILITY

From the foregoing discussion it will appear that by Credibility is meant the cohesion of a mental relation considered in relation to experience. It means the cohesion of a relation that is represented, not *simpliciter*, or abstracted from experience, but with direct reference to its congruity with experience. If the represented relation is congruous with experience, the degree of its cohesion or credibility is proportional to its degree of congruity, and when congruity increases in limit, credibility becomes knowledge—the thought is not only credible but credited. If the represented relation is incongruous with experience, the lack of cohesion is doubt, and, when incongruity increases in limit, doubt becomes incredibility. What is subjectively credible is regarded as objectively possible. What is subjectively incredible is regarded as objectively impossible.

What is meant by congruity with experience has already been indicated. It is the subsumption of the represented relation under an experienced relation, and the degree of congruity is the degree of likeness between the terms of the represented relation and the terms of the experienced relation.

To the cohesion of the relation—to the credibility of the thought—it makes no difference what the position may be in time or in space of the state of things to which the relation refers. We can estimate the credibility of matters in time past, or present, or future, and at any distance in the past or future. We can estimate the credibility of matters at any distance or position in space. We can estimate the credibility of a proposition with regard to the ultimate particles of matter, or with regard to the composition of a nebula, or with regard to the feelings and thoughts that were entertained by some man who has been dead for centuries, or that may be entertained by one who is not yet born. All that is necessary for an estimate of credibility is the representation of a relation, and its comparison with the representation of those experienced relations that it most resembles. According to the degree of resemblance is the credibility.

That Credibility is in all cases a function of experience will probably be to some a truism, to others a paradox, while a third group may admit the statement with regard to some thoughts and deny it with regard to others. The difference rests upon differences in the meanings

that are attached to the word experience. The credibility of the proposition that the letter that I received this morning was from my friend Jones, rests wholly and manifestly upon experience. The handwriting and the signature, the address stamped upon the paper, the references that the letter contains to facts known to Jones and myself only, are all congruous with experiences that I have previously had, and upon this congruity my belief is founded. But the credibility, equally maximal, of the proposition that there is on the other side of the world a vast country called India, peopled by dusky races and governed by countrymen of my own, does not rest directly—does not rest in the same sense —upon experience. I have never been to India. I have never seen the country nor its people. I have had no experience of its government, either as governor, as governed, or as spectator. I have had no direct experiences with which the represented relation can be compared, and therefore congruity with such experiences is out of the question. But yet the credibility of the proposition that India, with its teeming millions, exists, is quite as complete as that of the authorship of the letter. In both cases it is maximal, and amounts to knowledge. On what then is the knowledge of the existence of India founded? It is founded entirely upon hearsay—upon testimony. At school I was taught the history of its gradual acquisition; and since then I have read books of travel, sport, biography, mythology, and so forth, which not only explicitly assert, but on every page imply, the existence of the country. I have seen innumerable references to it in newspapers; I have seen reports of debates in Parliament on its finances and its government; have subscribed to funds to alleviate its famines; have met people who asserted that they had lived there; have purchased goods alleged to have been brought from there; and have accumulated evidence of the most varied kinds and of immense quantity, all tending to enforce and corroborate the credibility of the proposition. All this evidence is hearsay; yes, but all is experience. Every item is itself an experience;—a direct experience of its own existence; an indirect experience of the existence of India; and if the existence of India is so entirely credible that I can fairly regard it as known, it is because the represented relation is congruous with all these indirect experiences. Each book, each newspaper paragraph that I have read, each reference of my Anglo-Indian friends to the country in which they have spent their lives, each picture of Indian scenery that I have inspected, is an assertion of the existence of that country; is an indirect, a vicarious,

experience of its existence; and the complete likeness of the represented relation of its existence to the relation thus indirectly or vicariously experienced, constitutes a credibility so strong as to merge into positive knowledge; and I may fairly say that I know that India exists.

It is necessary, therefore, to recognise two forms of experience, direct or indirect; or direct and vicarious; or our own experience and the testimony of others to their experience. Each of these, under proper conditions, forms a valid basis of credibility, and our task is now to examine these conditions.

When the experience with which the represented relation is compared is direct experience, the credibility of the relation depends upon the degree of likeness that can be established between it and relations that have been established, and depends upon this alone. A pig that is naturally of a bright apple-green colour is incredible. It is not possible to imagine it as occurring in actual experience. Why is it not possible? Because not only have we never seen a pig of that colour, but we are unable to subsume the relation under any wider relation of a moderate degree of similarity to it. There has not only been no experience of bright green pigs, but no experience of bright blue, or bright red, or bright yellow pigs. Nor is this all: there has been no experience of any mammal of a bright green or any bright colour. It is true that there are baboons which are of bright colours on certain parts of their surface, but the likenesses between baboons and pigs on the one hand, and between a small portion of the surface and the whole surface on the other, are not sufficiently pronounced to affect materially the credibility of the relation of a pig to a complete covering of bright green. If there were experience of pigs with faces as bright coloured as those of some baboons; or if there were experience of baboons, or especially of other pachyderms besides pigs, that were completely enveloped in bright colour; the credibility of a bright green pig would be materially increased; and it would be increased because of the greater similarity of our experiences to the relation represented. Still greater would be the credibility of a bright green pig, if pigs of various shades of bright blue had been experienced; and if a pig of a bright green colour had actually been seen by us, increase, in limit, of similarity to identity of the experienced to the represented relation, would be accompanied by an increase, in limit, from credibility to knowledge of the latter.

A relation which is completely incredible is regarded as objectively impossible, but it is obvious that there is no completeness of incredibility in any absolute sense, short of inconceivability. A represented relation may become more and more divergent from actual experience until a point is reached at which impossibility can be predicated, but this point is not sharply defined. While we may say that the existence of a bright green pig is incredible, we should perhaps hesitate to say that it is impossible, thus admitting the existence of some lingering remnant of credibility in the relation. But even this remnant is abandoned when the relation represented is that of a pig with the head of an eagle; and if this is regarded as completely impossible, it will be found exceeded in impossibility by a pig with the head of a lobster. The abandonment of the last remnant of credibility and the increase, if increase can be allowed, in the estimate of impossibility, are due to the continual increase in the unlikeness between the represented relation and any relation that has been experienced.

If, then, the degree of credibility of a relation depends upon its congruity with, or likeness to, experienced relations, then it would appear that extension of experience, by which we increase the variousness of the stock of memories with which the represented relation can be compared, must increase the range of credibility—must increase the number and variety of relations that became credible; and this is undoubtedly the case. Before the ornithorhynchus was discovered in 1799, naturalists would have regarded as highly incredible the assertion that a mammal existed with the beak of a bird. When the bacillus of tubercle was discovered, the credibility of the causation of other specific diseases by the ravages of microscopic forms of life received an immense accession. When Columbus discovered land on the further side of the Atlantic, the credibility of its existence was raised at once to a maximum. When Magellan had circumnavigated the globe, the sailors who accompanied him could no longer doubt that it was a sphere. It was incredible that a tunnel of five miles in length could be driven under the Alps, until the construction of tunnels of greater and greater length provided experiences under which this thought could be subsumed. It was incredible that a gun could be constructed to propel its shot a distance of eight miles, until the attainment of greater and greater ranges provided experiences with which the thought could be compared. And so with a thousand other incredibilities which have become credible by extension of the range of experience.

But if extension of experience increases credibility in this way, it has another influence in the reverse direction. It renders many thoughts incredible that were before credible, for it provides, not only experiences to which thoughts can be found congruous on comparison, but also experiences with which thoughts can be found incongruous—provides a more comprehensive standard not only for the establishment of likenesses but for the establishment of differences—provides experiences, not only of relations, but of the negation of relations—gives us a standard, not only of possibility but of impossibility—provides uniformities of experience which render incredible concepts that were before credible, because subsumable under relations that, with a narrow experience, seemed variable, but with a wider experience are discovered to be included in one comprehensive uniformity.

To the uncultured man, to whom experiences of uniformity are few and limited, multitudes of relations are credible which to the cultured are incredible. To the one the existence is credible of giants a hundred feet high. The other, from a wider experience of the uniformity of ratio of bulk, weight, and muscular strength, is able to infer with confidence that the limbs of such a being would be so heavy, that he would be unable to move them; that supposing him to be proportioned like other men and stand upright, his legs would break under the weight of his own body. To the one the existence of a griffin or a dragon is credible; the other, from a wider experience of the uniform relations of limbs to the muscles by which they are moved, recognises that the existence of wings implies the existence of correspondingly large masses of muscles to move them, and of correspondingly modified bony structure to give attachment to these muscles. To him, therefore, the existence of a creature with wings projecting from his back and without the accompanying modifications of structure for the attachment and movement of the wings, is incredible. To the child it is credible that the lips of one person should scatter frogs and toads as she speaks, and those of another pearls and diamonds. A wider experience of the negation of the sudden creation of both batrachians and gems, and of the storage of indefinite numbers of either in convenient proximity to the human mouth, discredits the story. To engineers in the early part of the nineteenth century it was credible that to travel at a speed of thirty miles an hour would be fatal to the traveller. Until recent years it was credible that the world came suddenly into existence in the year 4004 B.C.; that matter could be absolutely destroyed by combustion;

that the sun moves round the earth; that the earth is a plain bounded by a limitless ocean; that a perpetual motion machine is practicable; that the stars are set in spheres of solid crystal, of which the earth is the centre; and so of innumerable relations once credible, but now, by extension of experience, become incredible.

Indirect or vicarious experience is the ground of the credibility or incredibility of very large classes of represented relations, and testimony exercises a very large influence upon our mental life—is the origin of a very large proportion of our stock of experiences. Every educated man possesses, incorporated into the body of remembered experiences upon which his daily and hourly conduct is regulated, a vast number of experiences which are derived solely from testimony; which are to him maximally credible, which are regarded by him as knowledge, and yet which he never does, never proposes to, and perhaps never can submit to the test of direct experience. A case in point is that already alluded to of the existence of foreign countries, of their physical features, their mountain ranges, their rivers, their fauna and flora, their mineral products; of their inhabitants, and of the appearance, costume, political organisation, history, customs, and so forth, of these inhabitants; and a thousand other particulars with regard to them. From the same source we derive most of our knowledge of our own country. From the same source is derived by most of us whatever knowledge we possess of the laws of our own country, in conformity with which we endeavour to shape our conduct. From the same source is derived by most of us whatever knowledge we possess of the fundamental principles of science,—of the size and rotundity of the earth; of its relation to the sun and the solar system; of the existence and law of gravitation, of the correlation of different modes of motion; of the laws, so far as they are known, of chemistry, of physics, of biology, and of all subsidiary sciences, and of the particular experiences upon which these laws are based. From the same source the merchant derives his knowledge of prices; the jurist his knowledge of law; the physician his knowledge of remedies; the manufacturer his knowledge of markets; the politician his knowledge of the opinions prevailing among his constituents; the investor his knowledge of the security of stocks; the retailer his knowledge of the quality of his goods; the labourer his knowledge of the market for his labour; the lady her knowledge of what is fashionable; the idler his knowledge of where to find

amusement; and all classes by far the greater part of their knowledge of what is passing in the world around them. To determine the credibility of testimony is therefore a task in which everyone is engaged during a considerable portion of his life, and it is important to discover the grounds upon which the credibility rests.

The credibility of the relation testified, that is to say, the degree to which its terms cohere, may rest, and commonly does rest, largely upon intrinsic credibility, or its congruity with direct experience; and in this respect will be governed by the conditions considered in the previous sections. But there are very many cases in which direct experience is either wholly wanting or is neutral with regard to the particular relation testified, and in such cases the cohesion of this relation will be determined by what may be called the extrinsic credibility of the testimony, or the credit given to the witnesses.

The extrinsic credibility depends upon: (1) the number of witnesses; (2) the independence of the different witnesses; and (3) the credit of each individual witness.

That, other things being equal, the credibility of testimony increases with the number of witnesses whose testimony is concurrent, scarcely needs insistence, and has been recognised in courts of law from a very early date. The Jus Civile did not allow the uncorroborated evidence of a single witness until the time of Constantine, who made a noteworthy exception. He decreed that the evidence of a single bishop should be accepted; but a very short experience of episcopal veracity caused him to modify his opinion. The very next edict forbade bishops to give evidence at all, either singly or in any numbers, nec voluntas, nec inviti, whether they would or no. The number of witnesses required was proportioned to the importance of the matter to which they testified. Two were sufficient for most contracts; five were required for a codicil; seven for a will; ten for a marriage (confarreatio); the implication being that the validity of the testimony increased with the number of concurrent witnesses. By the Salic law, a prosecutor was obliged to produce a certain number of compurgators, who swore that what he said was true. The accused had then to produce at least twice as many who swore that he was innocent; and the mere number of compurgators carried the day. The compurgators were not, it is true, witnesses to the facts in dispute. They were witnesses to character. They swore generally that the party who called them was trustworthy, and that if he said that a thing

was so, it was so. But to whatever they testified, it was number that prevailed. Under such circumstances a practice naturally grew of calling witnesses in unwieldy numbers, and their number had to be limited. The Canon law limited them to ten; but ordinarily the number of witnesses was proportional to the importance of the matter in dispute. It was said that a Pope could not be brought to trial except upon the concurrent evidence of seventy-two irreproachable witnesses.

2. If there be a plurality of witnesses, then the credibility of the thing testified to varies, other things being equal, with the degree of independence or want of connection among the several witnesses. If from various parts of the country there come letters, written by people of different occupations, sexes, station in life, etc., all written about the same time, and all testifying to observation of the same occurrence—*e.g.* an earthquake shock or a meteor—the credibility of the occurrence is, on this ground, maximal. If, on the other hand, all the reports come from the same district, from people of the same name, or are known to come from members of the same convivial club, the less degree of independence among the witnesses diminishes the credibility of the occurrence—increases the possibility of a mistake or a hoax. If several newspapers report the occurrence of different outrages in the same country, the occurrence of outrages is more credible than if but one reported them; but if the reports are supplied to the newspapers by the same individual, or if all the newspapers are owned by the same proprietor, or if the proprietors of all have an interest in spreading news of this description, the plurality of reports adds little or nothing to the credibility of the facts. If several witnesses testify to the undesirability of licensing a particular public-house, and if all are ardent teetotalers, the testimony of all is no more credible than that of one. If several members of parliament unite in condemning or eulogising a course of policy, and all are party hacks, the concurrence of testimony carries no weight.

The concurrence of several witnesses in testifying to the same thing requires no explanation so long as the thing is true. The circumstances under which witnesses lose their independence and unite in testifying falsely to the same thing are as follows:—

1. The concurrence of testimony may be deliberately designed. There may be a conspiracy to deceive, and all the witnesses may be wilfully lying.

2. The concurrence of testimony may be undesigned, and may be due to—

(*a*) The separate operation on each witness of the same influence.
(*b*) The separate operation on each witness of different influences.
(*c*) The influence of the witnesses upon each other.

3. There may be a combination of two or more of these circumstances.

The case of designed conspiracy does not need insistence; all will agree that such conspiracies are formed, and that they account for some cases of the concurrence of false testimony. It is the undesigned concurrence of false testimony that needs explanation.

(*a*) The most obvious occasion for such undesigned concurrence is when all the witnesses are independently affected by the same influence. Such a case occurs when several witnesses have made the same mistaken inference, as for instance when they agree that a certain man was drunk, the fact being that he suffered from organic disease of the brain, which produced symptoms indistinguishable by them from drunkenness. Cases in which the influence is of a different kind from the foregoing, but operates in the same way, are those of the proprietors of the newspapers and of the teetotalers instanced already. It is by no means necessary to the concurrence of their testimony that they shall have agreed between themselves beforehand as to its nature. The same influence acting upon each will produce independently similar results. So two men, who are total strangers to each other, may give concurrent false testimony as to the character of a third; each having a grudge against him, or each having been separately bribed by him. A number of witnesses may testify that they saw a certain man at a certain time and place, each being deceived by the likeness between him and another man. An audience of two or three hundred people will unanimously declare that the conjurer put the watch into the hat, all being deceived by the same means.

(*b*) Or the concurrence of the witnesses may be due to the operation of a different influence upon each. One man will tell, for the hope of gain, the same lie which another will tell out of revenge, and a third from pure fanaticism. The generally convenient course proposed for a certain railway, is testified to be generally inconvenient by one opponent because he dreads the competition of the new line; by another because he wants it diverted to his own property; by a third because

the traffic will interfere with his privacy; by a fourth because he objects to the noise; and by a fifth from pure hatred of novelty.

(*c*) Both of the foregoing classes of circumstances are tolerably obvious; but a less obvious occasion of the concurrence of false testimony is the undesigned influence of witnesses upon each other, due to that natural tendency to imitation, or to the equally natural tendency to revolt, which are elsewhere shown to be so deeply engrained in human nature. "As I listened," said Warren Hastings of the terrible indictment brought against him by Burke, "I thought myself guilty." Allowing for a little pardonable exaggeration, the effect on the mind of the person most interested, and most capable of believing the opposite, was yet evidently very great. How much greater must it have been to those who were neutral, or were already biassed against the defendant. And under such circumstances was it not natural, was it not inevitable, that the witnesses for the prosecution should be biassed—should be inclined undesignedly to colour their evidence; to state, as certain, facts of which they were before not certain; to heighten hardness into cruelty, cruelty into atrocity? How tremendous is the influence, in producing belief, of a concurrence of belief among others, is seen in the extraordinary contagion of panic, and in the common case in which a belief spreads like wildfire through a community. Each apprehensive fugitive gives testimony by his flight to the presence of an imminent danger; and such is the influence of all upon each that apprehension is rapidly increased to terror, and terror intensified into panic. The same influence is seen working in the opposite direction. In times of increasing prosperity, the readiness to give credit is contagious. Each man, seeing that all around him are confident of the solvency of their customers, becomes confident in his turn, and thus confidence begets confidence until a crash comes, when panic begets panic. Two ladies known to the writer produced in each other the firm belief that Mr. Gladstone was a Jesuit in disguise, who only awaited a convenient opportunity for establishing the Roman Catholic religion and rekindling the fires of Smithfield. Any statement made by them upon these and allied subjects was wholly untrustworthy; and the instance is an extreme one of what is met with every day in a less pronounced degree. In every profession and occupation, in every group or association of persons, by whatever bond they may be united, the influence of all upon each intensifies prejudice, and renders the testimony of each untrustworthy

in some department of experience. This is the origin of the Idola Tribus, and those who desire instances will find them in plenty in the chapters on Bias in Spencer's *Study of Sociology*.

In very many cases, the reason of the untrustworthiness of concurrent testimony is the combination of two or more of the influences that have been set forth, and the commonest combination is that of wilful falsehood with innocent falsehood arising out of it. One tells a lie, and another gives to it such complete credit that all his inferences with respect to relevant facts are coloured by it and brought into harmony with it. Thus arose the concurrent testimony of Tony Lumpkin and Mrs. Hardcastle as to the presence of the highwayman, and thus is created the concurrence of the testimony of knaves and fools in every case of imposture. Thus has arisen the testimony in favour of Spiritualism, of Esoteric Buddhism, of Christian Science, of the Tichborne Claimant, of every rotten financial project from the South Sea Bubble onwards, of palmistry, clairvoyance, and a thousand other impostures; hatched by rooks and fed by pigeons; born of wolves and suckled by asses; started by foxes and pursued by geese.

So far we have assumed that the testimony was the concurrent testimony of several witnesses. If the testimony of the witnesses be not concurrent, or if there be but one witness, then the credibility of the relation rests entirely, as in any case it must rest largely, upon the credit of the witness or witnesses. By the credit of a witness is meant the estimate that is formed of the congruity between his testimony and the thing testified, so that at this point our inquiry separates into two branches, viz.: (1) Upon what does the congruity of testimony with the relation testified in fact depend? and (2) Upon what does our estimate of this congruity depend? The distinctness of these two inquiries is evident. Testimony may be completely congruous with experience, and yet we may or may not yield credit to it. It may be completely incongruous with experience, and still we may or may not allow it credit. Our estimate of the credibility may differ widely from the credibility, and must therefore depend upon a different set of factors.

The factors that determine the congruity of testimony with experience are four, viz.:—

Faithfulness of narration of memories.
Faithfulness of memory of inferences.
Validity of inference from impressions.
Clearness of impression from circumstances.

We may take it that a memory will be faithfully narrated unless there is a reason to the contrary. It will be observed that we are not now dealing with the faithfulness of the memory, but with that of its narration. Whatever the faithfulness of the memory—however accurately or inaccurately it may reproduce the actual experience—it will be faithfully reproduced in speech or other mode of testimony, unless some influence is at work to bring about a discrepancy; in other words, a man does not lie without a reason. This doctrine is in apparent opposition to the well-known fact that savages, and generally persons of a low order of intelligence, are not only habitually untruthful, but do not appear to recognise any clear distinction between truth and falsehood; but it will presently appear that the opposition is apparent only. For the present we will at any rate assume that memories will be accurately reproduced in words in the absence of any reason to the contrary. We have then to seek the influences which produce inaccuracy in narration.

The first of these, the most obvious, and one of the most potent, is the interest of the narrator. He has some end to serve, some advantage to gain or some disadvantage to avoid, by inaccurate narration, and his narration is inaccurate accordingly. But men do not of necessity lie whenever it suits their interest to do so; and some are truthful even to their own hurt, while others are as steadily devoted to lying and as indifferent to its consequences as others are to truth. How many scores of wretched women have not confessed to riding upon broomsticks, to having sexual intercourse with Satan, and to a farrago of impossibilites, well knowing that their statements would bring upon themselves a dreadful punishment? What is it then, that determines in any given instance, in which the interest of the witness is in conflict with the faithfulness of his narrative, whether he will tell the truth or no? It is the ratio which two motives bear to one another—the desire of benefit to himself and the desire to avoid injuring others. A man of great rectitude of feeling and conduct will have little hesitation in embroidering his narrative for the mere sake of adding to its interest, if by doing so he does no one any harm. He derives but a small benefit it is true,—the mere gratification that attends the temporary arousal of the attention and interest of others in his proceedings, but on the other hand the injury to others is still less than the benefit to himself. His story reflects discredit on no one, and is not one on which action is the least likely to be founded. The ratio of benefit to himself, small though that benefit may be, is maintained at a maximum with respect to the harm

done to others, since the latter is altogether inappreciable. If the benefit to himself is very great—if for instance he can, by telling a lie, escape from some dangerous predicament—he will still be guided by the ratio of benefit gained to harm inflicted. If he can by his falsehood rescue himself from death at the cost of the death of his neighbour's horse, he will tell the lie; if only at the cost of his neighbour's death, he will not. And it is obvious that the ratio of benefit to harm that justifies him in his own eyes in telling the lie, varies with each individual, and depends upon what we may term his moral character, or his standard of rectitude. That the truth of testimony depends, *cæteris paribus*, upon the rectitude of the witness, is no discovery; what remains to be shown is that this is by no means the sole factor in the accuracy of narration, even when observation is careful and memory faithful.

The particulars of an experience may be clearly and faithfully remembered, and yet testimony may be false from failure of ability, and not of will, to narrate faithfully. Testimony is a matter largely of words, and the vocabulary of the witness may not be suitable to express the thoughts that are in his mind. A man may have an accurate visual representation of a machine, but he may be unable to describe it for want of knowledge of the names of its parts. He may faithfully remember the expression of bewilderment on a man's face, and faithfully represent the corresponding emotion which that expression aroused in him, but he has never heard the word "bewilderment," and he is therefore unable to testify either to the expression or to his interpretation of it. An attendant on the insane may have a very faithful memory of the conduct and demeanour of his charge, but he cannot describe it; all that can be got from him is, "He's quite lost," or "I can't make anything of him," or "You can't get anything out of him," or "He doesn't know anything," or "He's quite stupid." "But what does he *do*?" you ask, and all the answer you will get is, "Well, he's just demented." A lady goes to the milliner's to get a ribbon of a certain colour, and thinks the milliner very stupid for being unable to recognise the precise shade of red or green that is required, the difficulty being due to the fact that the customer is unable to name or describe the shade. Every invalid is familiar with the fact that pains differ in quality as well as in intensity, but no invalid is able to describe to his doctor the precise quality of his pain. It may be faithfully enough remembered, and the desire to describe it accurately is strong, but there are no words available for the purpose. The labouring classes in Man-

chester have at their choice, for the description of their ailments, but three forms of words. What they are suffering from is either, "It's all i' my back," or "It's all i' my yedd," or, if the malady is severe, "It's all o'er me." Sometimes it is possible to ascertain more accurately that the "It" which is in the "yedd" is "maaziness," but more precise information than this is seldom to be got. They suffer, no doubt, from the same kinds of pains and the same kinds of disablements that other people endure under the affliction of the same maladies, but they have no vocabulary corresponding with what is in their minds, and consequently their testimony is of little value.

Vitiation of testimony arises very frequently from the misuse of words, and the commonest misuse is the unnecessary and inappropriate employment of superlatives. The witness is under the influence, perhaps, of some emotion when his testimony is given, and his emotion finds expression, as emotion in apt to do, in words; but instead of confining the expression of his emotion to words which are mere expletives and serve no other purpose, he allows a portion of it to escape in exaggerating, not only the emphasis, but the strength of the verbal description. Very commonly the use of superlatives, and of exaggerated expressions generally, is the result merely of slipshod inaccuracy and inattention to the meanings of words. Very commonly it is the result of laziness, of disinclination to take the trouble to search for the appropriate word, and to such a length may this indolence be carried that there are large classes of persons who, in the ordinary affairs of life, restrict themselves almost entirely to the use of a single adjective to qualify words of the utmost diversity of meaning. The particular word used varies, oddly enough, according to the social station of the user: among one class it is "bloody," among another it is "awful." Among women one may hear articles of costume, of the most various kind, and of the most diverse qualities and appearance, all denominated "smart." When two things are compared, it is extremely common for one of them to be alleged to be "infinitely better," "infinitely worse," "infinitely stronger," or weaker, or more agreeable, or convenient, when what is meant is that it is considerably so. As common and as vicious is the misuse of the word "absolute." Some instrument or tool has its utility somewhat impaired; it is said to be "absolutely useless." A viand is less appetising than it might be; it is "absolutely uneatable." An article has its value diminished; it is "absolutely worthless." A man makes a mistake; he is an "absolute fool." The word "perfect" has been

abused in precisely the same way, in being applied not only to things that were imperfect, but to things of which perfection could not properly be predicated. A thing or a person is said to be "perfectly hideous," or "perfectly odious," or "a perfect bore," "perfectly silly," and so forth, the words perfect and perfectly being misused with slovenly inaccuracy for extreme and extremely; and very frequently applied to cases in which extreme and extremely would be too strong.

Another not infrequent case, in which the credibility of testimony is impaired in its narration, is in the use of words which carry one sense to the witness and a different sense to the hearer. Most of the instances in the previous paragraph might be examples of this source of error also. The witness may describe a thing as perfectly elastic, or a thermometer as at absolute zero, or one line as infinitely longer than another, and might be understood, by a person accustomed to the accurate use of words, as meaning what he said; when, in fact, all that was meant was that the thing possessed a considerable degree of elasticity, that the thermometer stood at the zero of Fahrenheit, and that the line was much longer. If these particular instances are unlikely to occur, as may be admitted, yet allied instances are common enough, especially in terms connoting degrees, and in terms that have a technical and restricted as well as a trivial or extented meaning. A classical instance is that of the Chancery Judge trying unwontedly a criminal case, and regarding the testimony that the prisoner asked for his "bloody coat" as a corroboration of the charge of murder made against him. A *large* tumour means one thing to the patient who suffers from it; quite another to the surgeon who treats it. An *exact* measure is one thing to a tailor; quite another to a maker of scientific instruments. A *long* walk is one thing to an elderly lady; quite another to a mountaineer. An *expensive* article is one thing to an artisan; quite another to a millionaire. A *desperate* battle is one thing to the recruit; quite another to the veteran. What to the landsman is a fearful storm, is to the seafaring man a capful of wind. The use of technical terms is a very common occasion of misunderstanding, and of impairment of the credibility of testimony from want of agreement between narration and memory. A witness declares that all the books were unbound, and is understood to mean that all were destitute of covers, when his statement was consistent with the actual fact that they were all covered in cloth. Or he says that the edges are uncut, and is understood to mean that they are unopened. A cook declares

that there are no herbs in the garden, a botanist that there are none in a certain patch of ground, and each regards the other's statement as inaccurate; the herbs referred to by the one being culinary herbs, those referred to by the other being plants with herbaceous stems. A drover testifies that he was driving a drove of hogs, and is understood to mean that he was driving pigs, when he meant, and correctly stated, that he was driving sheep less than a year old.

Allied to the difficulty of description from want of appropriate words is the difficulty that arises from unfamiliarity with the use of words, a very frequent source of impairment of the credibility of testimony. Two lookers-on at some spectacle may have equally faithful memories of what occurred, but the one, a newspaper correspondent, who is in the constant habit of describing what he sees, is able to produce a verbal picture much more readily than the other, who is unpractised in the art. A very large proportion of the inaccuracy of testimony is due to this unfamiliarity with the use of words, and the inability to arouse the memory of the appropriate word leads to the adoption of one that is less appropriate, and that expresses the meaning with less accuracy. The actual vocabulary stored in the memory may be sufficient, but the vocabulary that is ready to hand, that is available for instant service, is limited, and thus leads to the same result as if the words were not merely unremembered, but unknown. Indeed, it might be said, with a near approach to accuracy, that everyone possesses two vocabularies: one consisting of the words that he is in the habit of using, or that occur to him spontaneously in expressing his own thoughts; and another consisting of words that may be quite as intelligible, quite as accurately defined in their meanings, and many of them as familiar, but whose use to him is limited to their passive employment in receiving the testimony of others. Well as he knows their meaning, familiar as they are to hear or to read, yet he does not utilise them in his own speech. They do not occur to him spontaneously. That this is so is shown by the frequency with which the suggestion of a different and obviously more appropriate word, is accepted by a speaker or writer and substituted for one which had presented itself to him. One has a large vocabulary in the bank, the other has it in his pocket.

Granting the honesty and the capability of the narrator, the other influences which affect the credibility of evidence—which affect it by affecting the faithfulness of memory, the validity of inference and the clearness of impressions from circumstances—are considered in their places in other parts of this book.

Such are the influences which determine the congruity of testimony with the experience testified to; we may now take up the second branch of the present inquiry, and seek the factors that determine our estimate of this congruity, bearing in mind that our estimate is by no means necessarily a correct one. If, however, we can identify the factors that determine the estimate, we may, by keeping a watch upon them, increase the accuracy of the estimate itself; we may be able more correctly to apportion to witnesses the credit that they deserve.

The estimation of the congruity between the testimony of a witness and the character of his experience is a complex mental operation. It includes the formation both of a Judgement and of an Expectation.

The judgement of the credit of a witness is the discernment of likeness or unlikeness in the character of the testimony to that which has in experience been found worthy of credit, and it is by judgement that credit is allowed on the ground of what is called the demeanour of the witness, when the testimony is given orally. A thoughtful, weighty delivery gains for the witness more credit than one that is very fluent. It gives the impression that greater care is being exercised in attending to the memories and in selecting the words most appropriate for their description. A fluent and emphatic delivery gains more credit than one that is hesitating and devoid of emphasis, and upon similar grounds, viz. that it has been found in experience to be more worthy of credit. A witness who testifies unwillingly, and whose testimony has to be wrung from him word by word, is accorded little credit; it is inferred that he is keeping something back, that he anticipates detriment to himself from the testimony, and is biassed in narration. A witness who is unnecessarily eager is looked on with suspicion. It is supposed that he anticipates profit to himself from the reception of his testimony, and is therefore biassed in narration. But the most decisive estimate of credit that is attained by judgement is the discernment of consistency or inconsistency in the testimony. If every part of it is consistent with every other part, the credit extended to it is, *cæteris paribus*, high. If any part is inconsistent with the remainder, the credit is immediately deteriorated, and the wider and more irreconcileable the inconsistency in the testimony, the more completely is its credit destroyed.

A very large share in the apportionment of credit to testimony is due, however, not to judgement but to Expectation, in the sense in which this term is used in the section of this book so entitled; that is

to say, it is founded in part—in very small part—on Probability; in somewhat larger part on the recentness and impressiveness of previous experiences of similar testimony; and in much larger part upon the state of preparedness of the hearer's mind to accept or reject the testimony.

Probability, that is to say the ratio of the number of past experiences in which the testimony of the witness has been found true to the number of instances in which it has been found false, plays, *pace* the mathematicians, a very small part in determining the credit of the witness. In the first place, no record of the number of his performances of either kind is ever kept; and although we might, without any such record, remember the proportion of instances of true to false testimony if the instances were very few, the estimate would then be so uncertain as to be worthless; and when the instances became sufficiently numerous to give certainty to the estimate, such estimate would, in the absence of a record, be impossible. This objection, not an inconsiderable one, is however but a small part of the ground of our rejection of Probability from the estimate of credit. Supposing that a record were kept, and that we knew precisely that the testimony of a given witness had been false twice out of fifteen times, would $\frac{2}{15}$ths represent the Probability of falseness of a future instance of his testimony? The question is almost too frivolous for argument. Surely lies should be weighed as well as counted; surely a thumping lie on some important matter, in which the welfare of the witness and of others was concerned, must count differently from the mere embroidery of a narrative for the sake of stage effect? And surely we must take into consideration the origin of the falsity of the testimony? Is it due to unfaithfulness in narration, or to one of the other influences already enumerated—to lack of memory, or bias of one kind or another in inference; and if either of these latter, are we to assume that his memory of all experiences is precisely equal in deficiency, or his bias in inference on all subjects precisely the same in direction and in amount? Such assumptions would be doubly preposterous, but such assumptions must be rigorously adhered to if we are to assign a definite numerical ratio to the credit of a witness. But supposing a trustworthy estimate of the number, the nature, and the degree of inaccuracy of the various inaccurate statements of a witness to be carefully made; supposing that we could say that over a large number of cases he had told $\frac{15}{17}$ths of the truth, or had told the truth 15 times out of 17,

in the first place should we if we could, and in the second could we if we would, estimate the Probability that his testimony on the next occasion would be true at $\frac{1}{1}\frac{5}{7}$ths? It is certain that both questions must be answered in the negative. Supposing that we could so estimate the probability of his testimony being true, supposing that the words had to us a definite meaning, it is certain that we should attach to the instances of untrustworthiness a far greater importance than to those of trustworthiness, and should conclude, not that since he had been accurate 15 times out of 17 the probability was $\frac{1}{1}\frac{5}{7}$ths that he would be accurate now, but that, since he had told at least 2 lies out of 17 statements, no reliance could be placed on his testimony. When counsel succeeds in proving that a witness has on two previous occasions perjured himself, will it add anything at all to the weight of his testimony with the jury if counsel on the other side shows that on 15 occasions he has spoken the truth? Not one whit. But if we are so impressed with the arguments of mathematicians as to conclude that this position is illogical, and that we ought to estimate at this precise numerical ratio the probability that the witness is giving trustworthy evidence, can we so estimate it? Can we give to the words a specific meaning? Can we represent to ourselves with precision the mental relation that corresponds with the statement that the value of his evidence is $\frac{1}{1}\frac{5}{7}$ths? This depends upon what we mean by the statement. If we mean that in future 15 out of 17 of his statements will be true, no doubt we can entertain it; but if we mean that $\frac{1}{1}\frac{5}{7}$ths of any statement will be true, or that the cohesion of our mental relation is $\frac{1}{1}\frac{5}{7}$ths of any unit, then as I have elsewhere endeavoured to show, we cannot entertain it.

The expectation that the testimony of any witness is congruous with his experience—the expectation that the testimony that he is about to give will be congruous, or that that which he has given would be found congruous if tested by reliable records—depends much more upon the recentness and impressiveness of past instances of his testimony, which have been found congruous or incongruous, than upon their Probability. That recent experience of his trustworthiness inclines us to accord him credit, is well known to every practitioner of the "confidence trick," and scarcely requires insistence; but a few words must be said on the influence of the impressiveness of instances of trustworthiness. If a witness has previously testified to any circumstance which is of great "antecedent improbability," that is to say

which is highly incongruous with experience, and is found to have testified accurately, the impressiveness of this experience of his credibility greatly enhances the credit that we accord to him. If some unknown student were to announce a revolutionary discovery in electricity, we should accord to him much less credit than we should accord to Röntgen or Marconi; the credit given to the latter being due, not merely to our experience of the accuracy of their previous testimony, but to its impressiveness. That it is not solely due to their accuracy is shown by the credit that is given to the almanac makers, in spite of the falsity of the majority of their predictions. If Expectation were based upon Probability alone, the predictions of these gentry would be rated very low, since the great majority of them are false; but such is the impressiveness of the few cases in which they make a lucky shot, that the Expectation of their accuracy far outweighs its Probability, and they are accorded a degree of credit beyond that to which they are entitled. The same is true of palmists and other quacks who prophesy backwards, and pretend to read the past in crystals, and packs of cards, and so forth.

By far the most important factor in determining the Expectation of the accuracy of testimony is the state of mind of the person to whom the testimony is given. I do not now refer to the store of memories that his mind contains, that is to say to the congruity or incongruity of the testimony with his own experience, but to the effect of his emotional states upon the cohesion of the relation as to which the testimony is given. Some of these have already been considered under the head of Expectation, and obviously apply with the same force to a relation that has been introduced into the mind by testimony as to one that appears there from other sources. It is evident that the Expectation with which a testified relation is regarded is governed by precisely the same influences as that with which a predicted relation or a conceived relation is regarded. The position in time of the testified occurrence has, *per se*, no influence on our Expectation. But although the influences, which strengthen and weaken Expectation generally, apply also to the Expectation of the congruity of testimony with experience, there is an additional influence which applies to testimony alone, and as it has no influence upon the cohesion of relations that are not introduced by testimony, it has not yet been considered, and must now be dealt with. This is the influence of Authority.

Other things being equal, the degree of credit that is assigned to testimony is in proportion to the Authority of the witness. We have to determine what is the meaning and what is the origin of Authority. The term Authority appears to apply to a quality of the witness, but it does so only as colour applies to a quality of the object. It is an attributed quality: a quality resident in the mind of the hearer only, and by him attributed to the witness. Regarded as an attribute of the witness, the quality is called Authority; regarded as an attribute of the hearer, it is called Faith. Authority and Faith are the obverse and reverse aspects of the same thing. It depends entirely upon the hearer, and to each hearer the authority attributed to the same witness is, or may be, different. The authority of the pope on matters of doctrine is, to a Roman Catholic priest, maximal; to an Anglican priest appreciable; to a Buddhist priest inappreciable. It is evident that Authority is another name for credit; but it is credit of a particular kind, of a particular origin, and it is only by regarding its origin that it can be understood.

Authority is credit given to a witness on some other ground than those which have been enumerated. It is credit which is given, not because the testimony is congruous with the hearer's experience, nor from any estimate of the honesty or ability of the witness in narration, though authority would scarcely be attributed in their absence, nor is it given from any deliberate estimate of the ability of the witness to remember faithfully, to reason validly or to discriminate impressions clearly. Doubtless if the question were put, all these qualities would be ascribed to the witness, but they would be ascribed to him, not upon the ground that they had been found in experience to be possessed by him, but upon the same ground that the general credit to which they all contribute is acceded to him; on grounds independent of any direct experience of the credibility of his testimony.

That Authority is a mode or form of Expectation may not at first sight seem obvious, but if we regard it, not as projected into the witness as an attribute, but as it is in fact, resident in the hearer as an attitude of mind toward the witness, the difficulty is overcome. If it does not at once appear that Authority is a mode of Expectation, it will at once appear that Faith, the obverse of Authority, is a mode of Expectation. Yet if it be a mode of Expectation, still it rests upon grounds different from those that form the basis of the modes of Expectation hitherto considered. It certainly does not rest upon

Probability of the credibility of the testimony, nor does it rest upon Recentness nor Impressiveness of experiences of that credibility. It rests upon the preparedness of the mind of the hearer to credit the testimony of the witness.

It may seem as if the preparedness of the mind of the hearer to credit the testimony of the witness were only another phrase for credit already given to the witness, but there is a clear difference, although it may not have been clearly expressed, between the credit that is given and the influences which induce us to give credit. What these influences are, can be ascertained only by considering the origin of Authority, by considering how it comes about that credit is given to a witness of whose credibility we have no experience. This is a matter that no amount of introspection will enable us to discover; for an explanation we must turn once more to biology.

The importance to mankind of the gregarious habit, and the surpassing power of the instincts and habits of mind that contribute to the maintenance of the gregarious state, are subjects of frequent reference throughout this book, and in more than one place the supreme importance has been dwelt upon of the part taken by obedience and submission in contributing to the integration and consolidation of a community, and so to its increase in organisation and its superior efficacy in the struggle for life. Thus, in every militant community, and, up to the present stage of human development, all communities have been militant, obedience and submission have a very high biological value, and are correspondingly well developed. They have in very many cases become so highly developed as to overpower the much more primitive instincts of self-conservation, and even of reproduction. Distinct from love of fighting, from spirit of adventure, from patriotism and from all other motives, is the willingness to act and to suffer at the bidding of others. At the bidding of authority the Fijian, the Chinese, and men of other nations, stand calmly and proudly to be decapitated. At the bidding of authority the priest renounces the exercise of his most fundamental instinct, and maintains that renunciation throughout his life. At the bidding of authority the low-caste Hindu accepts without a murmur the degradation of his position. At the bidding of authority men will accept not merely death, pain and degradation, but ridicule. At the bidding of authority an elderly gentleman will dress himself up in a ridiculous costume and walk backwards the whole length of a room, bowing as

he goes. The power of authority in influencing the acts of men has been the subject of admiration from a very early age. "Whatsoever [the King] commandeth them, they do. If he bid them make war the one against the other, they do it: if he send them out against the enemies they go, and break down mountains, walls and towers. They slay and are slain, and transgress not the King's commandment: if they get the victory, they bring all to the King, as well the spoil, as all things else. Likewise for those that are no soldiers, and have not to do with wars, but use husbandry, when they have reaped again that which they had sown, they bring it to the King, and compel one another to pay tribute unto the King. And yet he is but one man. If he command to kill they kill; if he command to spare they spare; if he command to smite they smite; if he command to make desolate they make desolate; if he command to build they build; if he command to cut down they cut down; if he command to plant they plant. So all his people and his armies obey him: furthermore he lieth down, he eateth and drinketh, and taketh his rest: and these keep watch round about him, neither may any one depart and do his own business, neither disobey they him in anything." So wrote the young man in the camp of Darius 2,500 years ago, and what was true of authority then has been true ever since, and doubtless had then been true for ages. There is therefore no difficulty in appreciating the tremendous strength of the instinct which impels us to accept commands and to regulate our conduct in accordance with them. A command from the tribal leader is received and obeyed without question, and upon this unquestioning reception and obedience, the prevalence of the tribe in very large measure depends. This is the fundamental fact which underlies the credit given to a person in authority. The instinct of unquestioning obedience having once been established, the remainder of the explanation is easy. In every command an assertion is embodied. "Kill that man" conveys not merely the command to kill, but the assertion that a man is there. "Go to that hill" conveys not only the command to go, but the assertion that there is a hill to go to. "Bring me that stick" conveys not only the command, but the assertion that there is a stick to bring. The combination of the assertion with the command leads inevitably to the same unquestioning reception of the one as of the other. The two are, indeed, not distinguished, but are received as a single behest. The savage who is told to go and kill the man who is concealed in the wood, no more hesitates to accept the assertion that

there is a man concealed in the wood than he hesitates to obey the command to go and kill him. But it is evident from a comparison of this instance with the others that a behest may contain command and assertion in very different proportions. It may be almost all command, as in the single word, "Go," or it may be in large proportion assertion, as in the behest to move a certain object from circumstances specified with great particularity to other circumstances similarly specified. The specifications of both sets of circumstances are assertions that such sets of circumstances will be found, that the object will be found among the one set and can be removed to the other. In uncultured minds, and also in minds with considerable pretensions to culture, the difference between a command and an assertion is not discriminated, or is but little discriminated, and the same unquestioning and unreasoning reception that is accorded to the one is accorded to the other. The identification of the command with the assertion is still more facilitated by their promulgation by the same persons, under similar circumstances and in similar forms. When the Israelites received the command "Thou shalt not take the Name of the Lord thy God in vain," and in the same sentence the assertion "for the Lord will not hold him guiltless that taketh his Name in vain," it cannot be supposed that they made any distinction between the command and the assertion as to their duty in receiving and adopting them. From whatever source, in whatever manner, under whatever circumstances, men are wont to receive, or do receive, commands, to assertions made from the same source, in the same manner and under the same circumstances, they will give Faith; and to that source, that manner and those circumstances will they ascribe Authority.

So to children the testimony of their parents has a credibility superior to that of others; so to schoolboys has the testimony of their masters. The soldier regards the testimony of his colonel in a matter, say, of science, or of value, as of greater credibility than that of a scientific expert or a valuer. The seaman similarly places faith in his captain. It is probable that a railway porter would attach more credit to a statement, even if quite unconnected with railway matters, made by one of his directors, than to the testimony of an outsider. So, in spite of repeated disillusion, the testimony of Government officials is still accepted with unwavering faith. The mere presence of a Government stamp on a box of pills, although it is indented to indicate merely the fact that a fee has been paid to the Government for registration

of the title, is assumed to guarantee the efficacy of the medicine. What although the Government continually breaks the contracts that it makes with its servants—cheats the private soldiers out of a penny here and sixpence there; makes a quibbling pretext for refusing this man his pension, that one his free kit, a third his re-engagement, a fourth the inquiry into his grievance, all of which have been formally promised—its contracts are still accepted: its promises are still believed.

As communities increase in size and heterogeneity, and as functions become differentiated, the mandatory and the assertory functions become in some degree separated, the former remaining in the Government, the latter being in large degree transferred to the priesthood, and to the assertions of the priesthood a higher degree of credibility is attached, to them more credit is given, than to the laity, and this credit is extended to them, not only in theological and ecclesiastical matters, but in civil matters also. What vendor of a quack nostrum; what patentee of a bicycle appliance; what manufacturer of soap, would not give a higher price for the testimonial of an archbishop than for that of a doctor, a professional cyclist, or a laundress?

The superior credit that is given to genuine authority is given also to the semblance and the accompaniments of authority, as is but natural, the power to distinguish between the several attributes of the same thing not being attained until a very advanced stage of culture is reached. Testimony given in an emphatic, authoritative tone gains more credence than that which is haltingly and timidly pronounced, and to many a statement credibility is allowed solely on the ground of the authoritative air of the witness. This is especially true with regard to uncultured people, by whom a statement, even violently incongruous with their experience, will be accepted upon mere assertion, if the assertion is sufficiently emphatic and authoritative—if, that is to say, it partakes sufficiently of the character of a command. But it is by no means true of uncultured persons only. By the great majority of people, the mere statement in a newspaper that a thing *is* so is accepted at once, provided the relation is not very incongruous with experience; while if the statement had been, as in the majority of cases it ought to have been, "we are informed that this is so," or "our inquiries have satisfied us that this is so," the credit given to the testimony would have been much less.

The credit that is given by the majority of people to political and

religious formulæ is given very largely upon the score of the authority ascribed to their promulgators; and indeed, in the case of religious formulæ, it is admitted and proclaimed that they are matters of Faith. It is true that the meaning attached to that word would not be allowed to be the same as that which is here given to it; but I am of opinion that, when analysed out, Faith will be found to be the reverse side of Authority, and to contain nothing else, so long as we distinguish between the doctrine held and the ground for holding the doctrine. If the term Faith is applied to the former, then I should regard it as an improper application of the term; if to the latter, then Faith is Authority. That is to say, it is that factor in the cohesion of a testified relation which is due to the Authority of the witness, or, more precisely, it *is* the Authority ascribed to the witness.

Besides the bias in the reception of testimony which is due to the faith in, or the authority ascribed to, the witness, there is a further bias due to the Desire to give credit to the testimony and to the Will to do so, which are best considered together. That the credit given to testimony can be affected by Volition seems to be assumed by those theologians who regard want of faith as sin; and although they would include under the term faith more than the amount of credit given to testimony, and although they would regard sin as including states of mind that are not voluntarily assumed, yet it seems most consonant with the general trend of their discourses to suppose that they do regard, as part of the sin included in want of faith, a wilful withholding of credit from testimony. On the other side there have not been wanting disputants to urge, not only that intention was a necessary element in sin, but that the credit given to testimony was determined entirely by the congruity of the testimony with experience, and was in no degree affected by the volition of the believer or disbeliever. That the sun stood still in the valley of Ajalon, or that the beasts came to Adam to be named, is incredible to these disputants, and is incredible apart from any attitude of Desire or of Will that they may entertain. They may have the strongest desire to believe literally every word of the Holy Scriptures, but they find these matters so highly incongruous with experience, that with the best Will in the world to give credit to the testimony, they find to their own dismay that it is impossible. They picture to themselves the results of the arrest of the earth's motion, supposing the principle of Inertia to continue, and they see among these results the shattering of every loose or mobile object on its

surface. They endeavour to represent the absence of the principle of Inertia, and they find themselves unable, by their utmost efforts, to do so. Having started with a very strong desire to find the testimony credible, and completely failing to do so, they conclude, from this and similar instances, that Desire and Will have no influence upon Belief. Such a conclusion would, I think, be too absolute.

That Will may exert a very appreciable effect upon Belief will appear I think from the following considerations:—

In the first place, if testimony is partly congruous and partly incongruous with experience, it seems clear that Belief may be strengthened or weakened by the direction of attention upon the congruity and its aversion from the incongruity, and *vice versâ*. It is in this way that the majority of people strengthen and confirm themselves in their political creed. The particular party to which they shall belong is determined partly by the mode in which they are brought up; that is to say by having only one side of the question presented to them; and partly by temperament, the more energetic and more reasoning natures joining the party of progress, while the less energetic and more instinctive minds adhere to the maintenance of the *status quo;* but whichever side a man chooses, or on whichever side he finds himself, he is confirmed in his position by the consistent practice of attending to that evidence only which supports his own view, and refusing to attend to that which is opposed to it. He reads the newspapers and listens to the oratory of one side only, and beginning by refusing to pay attention to the opposing evidence, he ends by denying its existence. Or a man reads the lying prospectus of some wild-cat company, and his desire being aroused by the inflated estimate of profit, he pays attention to the congruities between his experience and the statements that he finds, and neglects to pay attention to the incongruities. The same bias of attention that affects the credibility of testimony affects also the credit of the witness. We desire strongly to find, let us say, a justification for a war, and someone publishes a book which ascribes to our antagonist the vices of the Borgia engrafted upon the nature of the Fijian. The desire to give credit to the witness leads us to attend to the fact that he has lived many years among the people that he describes, and to refuse to attend to the fact that he has a pecuniary interest in the prolongation of the war. In this way it seems that Desire and Will in the hearer do very largely influence the credibility of testimony and the credit of witnesses.

Closely allied to the influence of Authority upon Belief is the influence of opinion, by which is meant the existence of a belief in the minds of our fellows. When we have evidence that any belief is strongly held by those around us, the evidence that it is so held is to us equivalent to evidence that the belief is congruous with experience, and is, as has been shown, one of the most powerful factors in promoting the cohesion of the thought. It is notoriously difficult to maintain a belief in opposition to that of our associates, and the majority of our beliefs upon matters not immediately presented to the senses are absorbed from our fellows, not deliberately and formally as sanctioned by authority, but accepted as of course as soon as we discover their prevalence.

It is obvious that in this direction also Will can influence Belief; for we can for a certain time and to a certain extent, turn a deaf ear to the opinions expressed around us, and refuse to be influenced by them. So too we can to some extent discount and allow for the influence of recentness and impressiveness upon Expectation, and thus in another way modify or strengthen our Beliefs by voluntary exertion.

But one of the most important ways in which Will can influence Belief, the recognition of which has no doubt formed the basis of the ecclesiastical position that unbelief is sinful, is the voluntary questioning of Authority. There is no doubt that there may come a time, when the utterance of Authority, as in the cases instanced, is so diametrically opposed to the teaching of experience, that the questioning of Authority is forced upon us; but, short of this, there is a vast area in which beliefs can be held so long as Authority is not questioned, and in which the questioning of Authority is not irresistibly compelled by any flagrant incongruity with experience. In this area Will has a very great influence upon Belief. He who sets out with the intention of searching out the basis of Authority, and demands the warrant under which his beliefs are dictated to him, must inevitably end in scepticism. But this course, this determination, though it is undoubtedly in large degree a matter of temperament and of inborn constitution, is just as undoubtedly in large measure under the control of Will. It may be inhibited; it may be restrained; it may be limited to some departments of authority; it may, for instance, be allowed and encouraged to run riot in matters of political authority, and be restrained from encroaching upon the authority of religion. In this way the influence of Will upon Belief may easily become very great, and it is to disbelief

arising from the exercise of Will in this direction that theologians have attached the stigma of sin.

ORIGINALITY

By an original thought is meant a thought which is arrived at—a relation which is established—by the intrinsic working of the mind, and not by communication from without. It is familiar to us all that a thought may be novel without being original, the relation having been established in the mind of someone else, and then communicated to us; but by an original thought we mean one of which the terms are brought together without this extraneous assistance, and the degree of originality is the degree of novelty of an original thought. But what is meant by the degree of novelty of a thought? By degree of novelty of a thought is meant the degree to which the thought differs from previous thoughts. How, and in what respect differs? Not in the nature of the relation which is established, for this relation can be none other than a relation of likeness or a relation of unlikeness. Nor in its terms, for each of the terms may be a familiar component of other relations. It differs from previous thoughts in that these terms, familiar though each of them separately may be, have never before been brought together in this relation of likeness or unlikeness; and the degree of originality of the thought is measured by the wideness of difference between the things now discerned to be alike, or by the closeness of similarity between the things, whose difference is now discriminated. When Jenner identified cowpox and "grease" in horses with smallpox, the high degree of originality of the thought consisted in the wide difference between the things that he brought together in a relation of likeness; when his namesake disentangled the symptoms of typhoid fever from those of typhus, and established the former as a distinct disease, the originality consisted in the closeness of similarity between the things which he discriminated as different.

It is in originality of adjustment to circumstances that intelligence is most conclusively displayed; and originality of thought is, without doubt, the highest manifestation of thought, it is the very crown and

flower of intellectuality. It is certain that adjustments of very great complexity to circumstances may be effected with a minimum of conscious thought. The movements of articulation and equilibration, the mechanical performance of the practised musician and the movements of writing, are cases in point; and although it is true that these adjustments were in their beginning accompanied by thought and by thought which must necessarily have been in some degree original, such originality of thought does not seem to be a necessary accompaniment of the formation of complex adjustments to circumstances. Acquired, as they are, by the successive addition of very small increments, the degree of originality of thought that accompanies their acquirement, is in any case very small, and it is quite credible, and even probable, that adjustments of a very high degree of complexity and elaborateness may be acquired without any originality of thought at all; without any corresponding complexity of thought being ever attained; in fact without any stage of the acquirement having any corresponding consciousness. We may imagine that, by the influence of natural selection, successive minimal increases in the elaborateness of nervous organisation, answering to increases in the elaboration of adjustment to circumstances, may become fixed in successive generations, until there is at length attained the very high degree of elaborateness that is witnessed in the conduct of many bees and ants, without the occurrence at any stage of the process of any answering complexity of thought. We can imagine these elaborate courses of conduct to be pursued blindly, instinctively, and without any conscious reference to the end which they subserve. We can imagine that in such cases, as in the cases of elaborate adjustments effected by ourselves, a fully organised nervous mechanism may actuate elaborate adjustments without any conscious accompaniment; and we may go further, and admit that this nervous mechanism may have grown into being under such circumstances that at no time in the course of the process was there a sufficient degree of originality to imply a conscious accompaniment of corresponding complexity. We may suppose that the nervous mechanism may have been perfected, not by the method of trial and error in individuals, with the deliberate, conscious and voluntary cherishing and repetition of successful, and abandoning of unsuccessful adjustments, but by the method of trial and error in the race, with the elimination not of the unsuccessful adjustments but of the unsuccessful individuals; and the survival, not of the successful adjustments, but of the success-

ful individuals. If elaborateness of adjustment is attained by this process, there seems to be no reason why it should at any stage have necessarily been accompanied by a corresponding complexity of consciousness, or by any consciousness at all.

But when the new adjustment is made in the lifetime of an individual by the modification of the action of the individual, then thought is a necessary accompaniment of the process, and then the accompanying thought is a novel thought; and in as far as new adjustments are original and not imitative, in so far is the novel thought not only novel but original. As the degree of novelty of the adjustment is the degree in which the adjustment differs from previous adjustments, so the degree of novelty of the thought is the degree in which it differs from previous thoughts, and so the degree of originality of the thought is the degree in which an original thought differs from previous thoughts. Hence it is evident that there is every degree of originality among thoughts, and that every uncommunicated thought that is not wholly a memory must have some originality. In as far as novel adjustments are made to circumstances, in so far there must be novel rearrangement of motion in the highest nerve regions, and in so far there must be thought and novelty of thought, and in as far as such adjustments are original and not imitative there must be originality of thought.

Now, the lives of very few animals are passed in circumstances that from beginning to end are wholly familiar, both to the race and to the individual. Except animals that live in the very simplest circumstances, such as monads, tapeworms, and certain other parasitic animals, there are none that do not sometimes have to make new and original adjustments to circumstances, and therefore to experience novelty and originality of thought. An animal may inherit a mechanism as completely formed as is the mechanism for walking in the chick, yet even this mechanism cannot be brought into play without some experience of trial and failure and retrial. And when the art of walking is attained, new locomotor adjustments have still to be made. Obstacles in positions that are relatively new—that are not exactly the same as those of obstacles previously met with—have to be avoided. Inclines, irregularities, variations of surface, that are not precisely like any previously met with are encountered, and have to be dealt with. They have to be dealt with in ways that are indeed but in very small degree novel, but that are combinations in slightly new forms of old methods. Nevertheless there is a small element of

novelty in them, and therefore an element of thought, and of novelty in the thought, and, if they are not imitative, of originality also. So that when we speak of a man without a spark of originality, we are using the language of rhetorical hyperbole. Such a man would be at the mercy of the first combination of circumstances that he experienced, for no such combination ever repeats with exactness any previous combination, and therefore to every such combination his adjustment must fail. His conduct would be wholly instinctive, and would be moreover rigidly and unmodifiably instinctive. Still, there are plenty of men in whom the power is greatly lacking of discerning differences in things that are *primâ facie* alike, and in discerning likeness between things that are *primâ facie* different, and from them to those who are endowed with exceptional powers in this respect, there are innumerable shades of difference. At the bottom of the scale there is the idiot who is incapable of discriminating the difference between bread and coal, and will chew and swallow them both with impartial appetite; who cannot discern the likeness between the steaming water that has scalded him before, and the steaming water into which he now plunges his hand. At the other end of the scale is the Newton who discriminates difference of parts in a thing so apparently uniform as light; who discerns likeness in movements so different as the fall of a stone and the revolutions of the planets. It is in such instances as these latter that originality of thought is admittedly most strikingly manifested, and it will be at once seen that the high degree of originality that they manifest is the close similarity, which before Newton's time was regarded as identity, in the things discriminated; and in the extreme diversity in the things discerned to be alike.

The power of appreciating likeness and the power of discriminating difference, although they are necessarily coexistent, do not appear to be always equally developed in the same individual; some appear to have a greater aptitude for discerning and rendering prominent in consciousness the one relation, others for discerning and rendering prominent the other, and according as the one or the other faculty preponderates, certain other qualities of mind are found to be well or ill developed.

Speaking generally, a high degree of originality in the discernment of likeness is a higher and rarer quality than a corresponding degree of originality in the discernment of difference, and it is to the high development of the former that the greatest thinkers have owed their

distinction. Macaulay says of Bacon that, "In wit, if by wit he meant the power of perceiving analogies between things which appear to have nothing in common, he never had an equal." His analysis of light would have distinguished Newton among his contemporaries if he had made no other discovery, but it is to his theory of Gravitation that he owes his immortality.

It is found that those whose minds are more prone to the discernment of likeness than to the discrimination of difference, are often more prone also, if not to experience, at any rate to express emotion. Thus women are more apt to experience as well as to express emotion than men. The expression of emotion by tears, which men lose at an early age, remains with women through life; and concomitantly, women are notoriously inaccurate, that is to say they have little power to discriminate differences, while they are very prone to discern likenesses in concrete things—in faces for instance. Some of the most marked and conspicuous instances of originality of thought in the discernment of likeness are given in the similes and metaphors of poetical writers; and poetry is the rhythmical or metrical expression of emotion. It may perhaps be, that that facility of combination of motion which underlies the capacity of discerning likeness, may also be a facility for the spread of those diffused waves of motion through the brain which underlie emotion; but however this may be, the association of facility in discerning likeness, with proneness to experience and readiness to express emotion, is certainly frequent.

On the other hand, the predominant tendency to the discrimination of differences frequently accompanies a proneness to attend to the differences of objects presented to the senses,—to what are called practical affairs, rather than to the differences among representative states of mind. That this is far from being an invariable rule is obvious from a consideration of the labours of the Schoolmen, who for four centuries maintained a school of thought in which the discernment of likeness had a disproportionately small place; but broadly and generally it indicates a very frequent concurrence. In the scientific world, the discriminators of difference are the day labourers, the accumulators of data, the observers, the collectors of materials; the discerners of likeness are, in their degree, the foremen, the builders, the architects. It is these who utilise, in the erection of comprehensive doctrines, the materials that have been accumulated by the others. The two faculties are, as has been so often insisted, by no means antagonistic, and the

wonder is rather that they should be so often separated than that they should be so seldom combined, but a reference to instances will show as conclusively that they frequently exist in disproportionate degree, as that their union in a high degree is the very highest type of intellect.* The undue preponderance of the one is exemplified in the journeyman scientist, whose labours consist in the ever-increasing minuteness of description of phenomena; the undue preponderance of the other is exemplified in the theorist who founds his theory upon insufficient induction. Such was the Pythagorean doctrine that all things are number: such was their doctrine of opposites, by which the universe was divided into odd and even, limited and unlimited, unity and plurality, right and left, masculine and feminine, rest and motion, straight and crooked, light and darkness, good and evil, square and oblong; such was the theory of the Realist Schoolmen, at least after Remigius, that the Essence or Universal Genus comprehends everything, and that everything that exists is a part of the Essence and owes to the Essence its existence. Nor need we go back to the days of Pythagoras or of the Schoolmen for instances of the hasty adoption of a theory, arrived at by the undue preponderance of the ability to discern likeness, unbalanced by a sufficient development of the ability to discriminate difference. Such an instance was the Social Contract of Rousseau; such was the assimilation of electricity to a fluid; such was the influence ascribed to Reflex Action in the causation of disease; and the memory of every reader will supply him with many more. Both classes of defects were recognised by Bacon, when he said that it is the vice of subtle minds to attach too much importance to slight distinctions; and it is the vice, on the other hand, of high and far-reaching intellects to attach too much importance to slight resemblances.

To some extent the words Talent and Genius are currently used to express the possession of a high degree of these qualities or faculties respectively. The terms are commonly used with deplorable lack of definition, but some approximation to these meanings attaches to them when they are used to express different kinds of intellectual power. It is true that we speak of a talented musician or other artist, and a musical or artistic genius, and in such use this meaning does not attach to them; but when applied in respect of purely intellectual qualities, it will I think be found, in the first place that the user of the term is unable to specify in what the difference between genius and talent

consists; in the second place that he is very confident that between them there is a difference, which, though not clear, is felt to be wide and decisive; and in the third place that, when this difference is illustrated by the adduction of instances, it is found that the examples of genius are examples of high originality in discerning likeness, and that the examples of talent are examples of high originality in the discrimination of difference.

APPERCEPTION

In considering the process of reasoning, we have dealt with it in a fragmentary manner, considering each individual step by itself, and the resulting thought as an almost isolated entity, having, indeed, a definite connection with the thoughts which form its premisses, and itself capable of forming a premiss for subsequent judgements; but otherwise disconnected from other mental contents. This, however, is but a partial and imperfect view. It will be seen, in dealing with Volition, that each individual act of will, complete in itself as it may be with regard to the immediate object in view, is yet but a portion, it may be but a small and insignificant portion, of a large scheme of volition for giving effect to a fundamental desire. A man consults a time-table and determines to go by a certain train, and when this determination is come to, as an individual volition it is complete and ended. But it is not an isolated volition. It is part of a comprehensive scheme. If he determines to go by train, it is because he has, as we say, a motive, for reaching a certain destination in a certain time. Without this motive the selection of the train would be meaningless, and would never be made. He goes to sell his merchandise, to consult his doctor, his solicitor, he goes to meet his mistress, or what not. And in every such case he has again a motive for selling his merchandise, for consulting his professional adviser, for meeting his mistress, a motive which, when we pursue it far enough back, leads us in the end to some primordial desire, behind which we cannot go. But if, when we have reached this point, we turn back and pursue the train in the opposite direction, we find, not a single train, but a perpetually ramifying system of volitions. The primordial instinct of self-conservation breaks

up at once into several branches of desire,—desires of avoiding hunger, cold, and other wants; and, as subsidiary to these, desire of accumulating property; which again may be effected in many ways, each of which has its corresponding desire, its corresponding volition, and its subsidiary groups and sub-groups of desires and volitions, the whole constituting an organised scheme of volition dominated by the primordial desire. And it is very important to note that the terminal twigs of this ramified volition are often, are in fact usually, out of sight of the main trunk. In other words, when we are pursuing the subsidiary volitions, we do so in complete indifference, and even ignorance, of the desires which are their ultimate motives. The merchant in haggling over his bargain is not prompted by the fear of want. The lover in scheming to meet his mistress is wholly unconscious of the underlying motive which prompts his action. The girl who is stirred to an enthusiasm of delight at the chance of nursing her sister's baby, little knows that she is prompted by her own blind craving for maternity. The volition of the moment is in every case prompted by a motive which, potent, dominant, effective as it is, is yet not present in consciousness. The immediate volition, which is vividly present, and occupies the focus while it seems to occupy the whole field of consciousness, is but part, it may be but a very small part, of an organised scheme of volition of which no other part is or seems then to be present. And the volition of the moment is not only a part of, but an outgrowth from the larger scheme, in whose absence it could no more exist than the twig could remain suspended in the air if the tree were cut down.

How large a part of willing consists of thinking, how close the union between will and thought, or rather, how incomplete the differentiation between them, is pointed out in the section on Volition, and if they are thus closely akin, it is not surprising if the systematic organisation so characteristic of the one is found to obtain in the other also. When a musician sits down to play on the piano a piece of music which he has never seen before, the first thing he does is to take note of the key in which it is written, and when the key is determined, the whole subsequent reading of the piece is modified. The notes upon the paper before him have now a meaning for him quite different to what they would have were the piece written in another key, and yet the key in which the music is written is never explicitly present in his mind throughout the playing of the piece. It is fixed and determined once

for all before the playing begins, and thereafter this thought modifies the whole of the subsequent mental operations, without once becoming a conspicuous integer in consciousness. Again, a man who is master of more languages than one, sets himself to answer an interlocutor in the language in which he is addressed. This gives him the keynote of his subsequent communications, and, the matter once settled, governs the rest of his conversation without further explicit reference. In the case which has been adduced in a previous section, in which an inference was drawn that a certain rustling sound was made by a snake, it is obvious that, previous to the drawing of that inference, the whole of the circumstances under which the sound was heard were in consideration. The country in which the traveller was, the fact that he was in the open air, the localisation of the sound in the grass at his feet rather than in the dead leaves above him or the brushwood at his side, the time of day perhaps, and the state of the weather—all these circumstances formed a coherent organised system, in the absence of which the inference would never have been drawn. If the rustling sound had been heard under other circumstances; if instead of hearing it in a jungle in Africa or India he had heard it in his own study in England, and if instead of localising it in the grass he had localised it in his waste-paper basket, his inference would have been very different. But yet, although his inference was guided and determined by this complex of circumstances, they were not, or but few of them were, explicitly referred to in arriving at the judgement. He did not formally say to himself, "I am still in the African jungle where snakes are common," but the knowledge that he was there was nevertheless an important factor in guiding him to his conclusion. Again, when we are playing a game of chess or whist, our whole scheme of thought is dominated by the known rules of the game. We do not explicitly and deliberately refer to these rules except upon occasion—except when we, or some other player, is accused of contravening one of them. But still, they are always a factor in the formation of our judgements—in the guidance of our thoughts. We never say to ourselves that we must not move a bishop as a rook moves; and there is no physical or external obstacle to our doing so. But the practice of the game has so modified our minds that there is an insurmountable internal barrier against such a move. We should never think of moving a bishop in any other way than along a diagonal. If we take up a bishop and examine its shape, we see at once that it has been made in a lathe,

and, as we make this observation, the whole system of the rules and practice of the game of chess is swept out of the mind and is replaced by our knowledge of the conditions under which lathework is accomplished; and in conformity with this new system of knowledge it is at once evident that, although the piece was made in the lathe, it could not have been wholly made by turning. The division of the mitre must, it is evident, have been cut by hand after the turning operation was complete. As we further examine the man, we notice a shake running up one side, and instantly all our knowledge of lathework is swept clean away, and for it is substituted a body of knowledge of the way in which wood shrinks in seasoning; and without any formal process of inference, we recognise at once from what part of the log the piece has been cut. In all these cases, not only the judgements at which we arrive, but the form and process of thinking that we go through, are determined by a body of knowledge previously arrived at, it may be by a very lengthy process, a body which holds together in certain definite ways, is systematised or organised. Such an organised body of thought is termed an "apperceptive system."

So far I am able to go with the apperceptionists, but when they speak of apperception as a separate, distinct, primary mental process, I am obliged to join issue. In apperception I can see nothing but a process of thinking, that is to say a process of establishing, by means of comparison, relations of likeness and unlikeness among mental states. Apperceptive systems are regarded by the thorough-going apperceptionists as quasi-independent entities, capable of apperceiving others and being themselves apperceived by others. To this I entirely demur. The different apperceptive systems that exist in the mind of one person are supposed to be like beasts of prey in a jungle, attacking and devouring each other by their own inherent activity. This seems to me an unwarrantable disintegration of the unity of the individual mind. I can allow to mental systems no such autogenetic spontaneity. If a system of knowledge incorporates into itself some new item, which falls into its place in some vacant niche in the system, it is not because the system stretches out its tentacles and gathers in by its own activity the concordant fact; but because the self, the Subject, takes the new fact and puts it into its place in the system. But the system is for the time being a part of the conscious self? Doubtless it is, but the point that I wish to insist upon is, that throughout the transition of one system after another, the active subject remains, and that it is this

active subject which does the work of bringing before it this system or that, of comparing the new presentation with the organised body of knowledge that it already possesses, and of determining, by its likeness or unlikeness, the suitability of this new presentation for incorporation with the old.

ERRORS OF BELIEF

Error of Belief may have either of two very distinct meanings. It may mean belief which is inconsistent with the past experience of the believer; or it may mean belief which, though consistent with the constancy in past experience of the believed relation, is falsified by subsequent experience. In the former case the belief depends upon some fault in the thinking process by which the belief is attained. In the latter the process of thinking may be normally conducted, and the erroneous result may be due to the character or the deficiency of the experience upon which the belief is founded.

An example of the second of these errors has already been given. I have had very many experiences of the relation between earthenware and fragility, and have found this relation, in every instance in which the experiment has been fairly tried, to be constant. I have had no experience of earthenware which is not fragile, and have found that the experience of others agrees with mine in this respect. The cohesion of the relation between earthenware and fragility being very great, I am shown a jug which is indistinguishable in appearance from earthenware, and by immediate inference I arrive at the conclusion that this article is fragile. So soon as this conclusion is reached, it is a belief. It is a mental relation having a degree, in this instance a high degree, of cohesion. I am unable to sever in my mind the appearance of the jug from the attribute of fragility, or to imagine that if thrown upon a stone pavement it will not break. The experiment is made, however; the jug is thrown upon the pavement, and being made, not of earthenware, but of enamelled iron, it does not break. My belief that it was fragile, my belief that it was earthenware, were erroneous. They have been falsified by experience subsequent to their formation. But were they warrantable at the time they were formed? Were they inevitable,

or ought I to have avoided them? This depends partly upon the individual experience itself, partly upon past experiences. It depends in the first place upon the similarity between the appearance of the jug and the familiar appearance of earthenware. If the two are indistinguishable in appearance, the error was unavoidable, and to have avoided the error would have been unwarrantable,—would have been abnormal. The whole of the validity of inference rests upon the constancy in experience of the formula $\frac{A : B}{a : b}$ and if the presented a presents no discriminable difference from experienced A's, then the relation $a : b$ must, by a normal intelligence, be inferred, and not to infer it would be abnormal. If a is discriminable from A; if, for instance, we handle the jug, and find that in its lightness of weight, in its thinness combined with opacity, it is unlike our familiar experiences of crockery, then indeed this unlikeness in the presented attributes would warrant us in hesitating to ascribe to it complete likeness in represented attributes, and then the error of attributing fragility to it might be avoided. But so long as a is indiscriminable from A, so long as the presented attributes of the jug are indiscriminable from those of crockery, so long we must, if we think normally, establish the relation $a : b$ like $A : B$. We must suppose the jug to be fragile, unless either the relation of fragility to crockery is inconstant in experience, or unless one of these relations can be assimilated to a wider relation which is inconstant. My experience that crockery is fragile is constant in a very large number of instances; but I have also had experiences that fragile substances may have their fragility lessened, and even, in the ordinary sense of the word, removed, by special treatment. The fragility of glass may be greatly lessened by the process of annealing. The fragility of chilled steel may be lessened or removed by tempering. The fragility of cast iron by heating and rolling. The fragility of brass and copper may be lessened by sudden cooling; and it is open to me to assimilate the relation between crockery and fragility to these relations; to suppose that by some similar process this relation can be relaxed or removed; and thus to introduce into the inference, that the jug is fragile, an element of doubt. But though such experiences might lead us to doubt whether crockery might not be made less fragile than it is, they would not, in the absence of any difference in the appearance of the jug from that of ordinary crockery,

lead us to infer that this particular article was less fragile than the crockery to which we are accustomed. The only experience that could lead us to doubt the fragility of the jug would be experience that things might resemble each other closely in presented attributes, and yet might differ widely in associated attributes. If this experience were universal, reasoning would be at an end. But if several such cases had recently been experienced, then the instance under consideration might be assimilated to them. If, for instance, I had recently tried to cut an object which presented the appearance of a loaf of bread, and discovered that it was made of papier-mâché; if I had tried to obtain a light from what purported to be a box of matches, and discovered that they were made of sugar—I might, if the circumstances under which the jug was presented to me were in any way similar, suspect a trick, and so suspend my judgement as to its possession of the attributes usually associated with appearances similar to those which it presents. In ordinary circumstances, however, the normal process of reasoning leads in this case inevitably to error, and it would be abnormal not to make the error.

The belief in witchcraft rests upon grounds that are in some respects similar, in others somewhat different. Certain powers, of causing disease, of riding through the air on a broomstick, etc., are attributed to certain individuals, and the relation of coexistence between the individuals and the powers is highly cohesive. How is this belief reached, and what is the reason of its high degree of cohesion—of the strength, as we say, of the belief? For the great majority of the minds that have held it, the answer is simple. It rests upon authority. The belief is absorbed from those around, it is accepted from those who are supposed to know; from those who are old; from those who are learned; from those who have exhibited knowledge in other matters, and especially in cognate matters; from those who are in positions of authority, whose behests are obeyed. The origin of authority we have already considered, and its efficacy in securing the cohesion of a relation has been shown to be very great. The case of the rank and file of the believers in witchcraft needs therefore no further explanation. If the belief was strongly entertained by those to whom the people looked as authorities, then the grounds on which they held the belief, plus their authority, accounts sufficiently for the general belief; but how to account for the belief held by the leaders? In their case again, both the thought itself and the cohesion of the thought—both

the form of the belief and the tenacity with which it is held—are due in great part to an influence which is closely allied to authority, and partakes in some sort of its nature. That is to say, they are derived from communication by others, from imitation. These leaders and promulgators of opinion received the opinion at a time when they were but disciples, and received it from those who were accorded authority; and, since the original reception of the belief, it has been frequently confirmed by the corroborative discovery that others continue to hold it. The number of those who examine, *proprio motu*, the validity of their beliefs, who translate them out of words into thoughts; who apply these thoughts to experience, and test the congruity of experience with them; is always very small. The great majority of men not only receive their beliefs ready made from their fellow-men, but retain them unchanged for life; and if a belief is changed, it is changed as a rule, not by comparison with experience and being found incongruous therewith, but by comparison with the beliefs held by others, and being found incongruous with them. The whole of the persons who at any one time believe in witchcraft have no doubt received their belief, and are maintained in it, by the influence of all upon each. The belief was originally derived from authority, and is maintained by conformity—by the influence, already considered, of the knowledge that the belief is held by others. Still, these considerations, while they account for the continued prevalence of a belief that is once established in a community, do not account for the origination of such a belief as that in witchcraft, which is ultimately falsified by experience, and which, as it seems to us who are free from it, might at any time have been found inconsistent with experience.

The fact that this particular belief has arisen independently in very many, perhaps in all, communities of men, and has prevailed in different ages, and among communities that could not have received it either from each other or from a common traditional source, shows that it rests upon experiences that are common to the greater part, if not to the whole, human race; and it is not difficult to see what these experiences are. They are, on the one hand, experiences of causation which are constant within the sphere of human activity; and on the other, they are experiences of events which cannot be attributed to human activity. The two relations are assimilated by immediate inference, and the changes which cannot be attributed to human activity are attributed to a causation as like as possible to human

activity—to the agency of invisible men. They are attributed to the agency of beings with all the qualities of men, except visibility and tangibility, and with powers greatly in excess of those of men. Such a thought, when established, is so fully consistent with experience that it becomes a highly coherent belief, and maintains its validity down to a very late stage of human development. It is fully consistent with experience in that, while it accounts for all those occurrences which cannot otherwise be explained; while it is consistent at once with the apparent purpose and with the apparent caprice of events; it is not contradicted by any specific experience. Even when this and that class of events are discovered to be within the natural, as contrasted with the supernatural, order, and to be due to the transfer of motion in obedience to known laws, that is to say, in ways that are constant in experience;—even when several and many of these discoveries have been made, there still remains a large residue of events not so explicable, and accountable by the anthropomorphic hypothesis only. It is not until a large majority of events have been found explicable by natural means, that the supernatural explanation becomes inconsistent with experience and is abandoned; but as soon as sufficient experiences of natural causation have been accumulated, the belief in supernatural interference can no longer be maintained. It becomes inconsistent with experience, and its cohesion is dissolved. As long as the majority of events are inexplicable by what we term natural laws—by assimilation to observed sequences of phenomena—so long the anthropomorphic explanation holds good as most congruous with experience, since the majority of our experiences of specific causation are then experiences of human activity. But as soon as the majority of our experiences of causation come to be experiences of sequences that are not capricious but are constant, so soon the anthropomorphic explanation becomes incongruous with experience, and is reserved and restricted more and more to events in which constancy of sequence cannot be discerned. There is therefore nothing to explain in the belief in witchcraft entertained by persons to whom the events credited to witchcraft have not yet been brought under constant sequences. The belief is congruous with their experience (or what is for practical purposes the same thing, with experience as interpreted by them), and to them is a justifiable and normal belief. That events which occur with apparent caprice, and do not owe their origin to known causes, are produced by human will, or by will that is quasi-

human, is the belief which is most congruous with the experience of ignorant persons, and in them is therefore natural, justifiable, and proper. It is a belief which is, to adapt the language of the Schools, valid *ante rem*. It is valid, that is to say, until practice based upon it has led to experience contradictory of it, and so is upon precisely the same footing as the belief in the fragility of the iron jug.

But, it may be said, the belief ought not to have been held, for the grounds for it were, as subsequent investigation has shown, insufficient. The normal course therefore, even in the absence of proof to the contrary, or of incongruity with experience, would have been, not to accept it as certain, but to keep the judgement about it in suspense. Our ancestors, with the means of knowledge at their command, ought neither to have believed nor to have disbelieved in witchcraft, but to have remained in doubt until further experience enabled them to form a trustworthy conclusion. Such a contention ignores the practical side of intellectual life. It must ever be kept in mind that thought is the subjective side of intelligence; that the rearrangement of mental relations is the revision of our modes of dealing with circumstances; that, in short, thought is nothing except as a basis for conduct. The circumstances, the events, which our ancestors explained by witchcraft, were not occurrences in another planet, destitute of interest for them except as matters of idle curiosity. They were matters of vital concern. They themselves, their wives and daughters, their husbands and sons, their cattle and sheep, actually suffered from the diseases, the pains, the disabilities, which they accounted for by the doctrine of witchcraft; and to deal with these circumstances a doctrine of their origin was necessary. Conduct is founded, not upon doubt and hesitation and suspension of judgement, but upon coherent belief; upon assured conviction; and for our welfare and prevalence it is expedient that, when circumstances are adverse, we should not supinely endure them, but should deal with them and seek to turn them to account. Knowledge is of value only as a basis for action, and action is possible only in so far as it rests upon a basis of knowledge. That pain and illness, that storm and flood, that murrain and death may be dealt with by action, some theory of their origin is necessary. In as far as the theory is erroneous, in so far will the action be inefficient; but to act upon a theory is to put it to the test. If it is erroneous, action based upon it will bring experiences that are inconsistent with it, and will ensure its abandonment or modification. But correct theory can

be reached only through incorrect theory. Knowledge is acquired by a series of approximations. Some basis of belief we must have for our acts. If the basis is erroneous, the action will bring about the correction of the belief; and, by successive corrections, belief is ever being brought more and more into harmony with experience; receives less and less rectification from experience based upon it. But at any given instant, belief is that thought which is most consistent with past experience; and so long as it is consistent with experience that is available to the individual, so long the belief is valid to that individual, is justifiable, is inevitable. As in the case of the unbreakable jug, the normal process of thought leads of necessity to a belief which is erroneous. It is erroneous if adhered to *post rem*—after action based upon it has brought experience inconsistent with it; but *ante rem* it is valid. It is valid in its congruity with previous experience; and as such, we are not only justified in acting upon it, but we must act upon it if we are to act at all. If we are to postpone action until we can base it upon a belief that is completely congruous with circumstances —that is, congruous *post rem*—it is obvious that we must postpone it for ever; for only by actual experience of circumstances, brought by action that is based upon belief, can the belief be modified and moulded into conformity with circumstances. Beliefs that are erroneous *ante rem* are not erroneous for those who hold them. Error can be properly predicated of those beliefs only that are erroneous *post rem*; that are still adhered to after experience inconsistent with them. These beliefs we have now to examine.

The first question that presents itself is, How is it possible for a belief to maintain its cohesion after experience which contradicts it? Is there, in fact, such a thing as a belief that is erroneous *post rem*, and if so under what conditions is it maintained? That beliefs do continue after experiences contradictory of them is certain, and such persistence of unwarranted belief is one of the commonest of mental occurrences. Most of the "fallacies of observation" enumerated by Mill are beliefs that are erroneous *post rem*. Among these are the beliefs that the weather-predictions of the almanack-makers are, upon the whole, correct; that "Fortune favours fools"; that objects immersed in water are always magnified; that the magnet exerts an irresistible force; etc. "The information which an ordinary traveller brings back from a foreign country as the result of the evidence of his senses, is almost always such as exactly confirms the opinions with which he set out.

He has had eyes and ears for such things only as he expected to see. Men read the sacred books of their religion, and pass unobserved therein multitudes of things utterly irreconcileable with even their own notions of moral excellence. With the same authorities before them, different historians alike innocent of intentional misrepresentation see only what is favourable to Protestants or Catholics, royalists or republicans, Charles I. or Cromwell; while others, having set out with the presumption that extremes must be in the wrong, are incapable of seeing truth and justice when these are wholly on one side." Other instances of beliefs held in the teeth of contrary evidence are those of the countryman that changes of the weather concur with changes in the moon; that the nocturnal vociferations of the cock take place at midnight and at three o'clock in the morning only; of the housewife that the sun shining upon the fire puts it out; of the pedagogue that a knowledge of Latin confers ability to write a good style of English; of the seafaring man that whistling brings wind; the whole fabric of beliefs in omens, charms, amulets, and what are ordinarily called superstitions. Errors in *scientia post rem* are therefore common enough. How are they to be accounted for? How can a relation maintain its cohesion in face of the separation of its terms in experience? The explanations are manifold.

There are at least three factors easily identifiable which make for the persistence of a belief that is erroneous *post rem*. The first is the vagueness of the belief itself, which, while it admits of contrary experiences, does not admit of specific contradiction by experience. The second is that events do not become experiences until they are interpreted; and an event which is incongruous with a belief may be so interpreted as to appear congruous with it. The third and most important factor in the persistence of error *post rem* is the active influence that belief exerts in repelling or preventing the appreciation of experiences. Let us consider the influence of these factors in a few concrete cases.

The countryman believes that changes in the weather are synchronous with changes of the moon; but his belief is very vague in character. The change in the moon is not localised to a specific hour, minute, and second, but is regarded as occurring on a certain day,—within a certain twenty-four hours. Changes in the weather, again, are not strictly localisable in time; they are gradual processes extending over several hours or days, and may at choice be localised on one

of several days. The synchronisation of the change in the weather with the change in the moon is not regarded as exact. The conditions would be sufficiently fulfilled, the belief would be sufficiently corroborated, if the one change occurred about the same time—within a day or so—of the other. Then again, some changes in the weather are so slight that they are left out of account. Thus it happens that by laxity in the concept of what is meant by a change in the weather, by dexterity in fixing the time of the change, and by a sufficient extension of the period that is called the change of the moon, a majority, and a considerable majority, of changes of the weather may be made to coincide more or less accurately with changes of the moon. The error is therefore scarcely to be considered as an error *post rem*, since experience, *as experience is interpreted*, does not contradict it. But supposing that a definite, pronounced and sudden change in the weather takes place, as often happens, midway between the phases of the moon, will not, ought not, this contradictory experience to destroy the belief? It certainly does not destroy the belief; and why not? As I opine for the following reasons. In the first place the experience, though contrary to the belief, is not contradictory of it. It proves, if it is attended to, that there are changes in the weather that do not concur with changes in the moon, but it does not destroy all connection between them. It lets in other causes of change in the weather, but it does not exclude change of the moon as a cause. But a much more potent reason for the non-destruction of the belief is that the very fact that the experience is incongruous with the belief repels the attention from it. The experience is not brought into relation with the belief. The change in the weather is not compared with the moon's phases. The experience is disregarded; or, if regarded at all, it is considered an anomalous exception which ought not to be taken into account. The attention is repelled from it; glances lightly over it; does not rest upon it; does not gather it up and compare it with the belief; and since the experience does not engage the attention, neither does it cling in the memory. It is soon forgotten; and if it causes any loosening at all of the belief, this loosening is purely temporary, the trifling wound soon heals, and the belief is as coherent as ever.

It is the same with other experiences that are incongruous with other beliefs. The very existence of the belief withholds or repels attention from the experience; and this withholding or repulsion of attention from experiences that are incongruous with belief is often so complete

that the experience is altogether ignored. Bring to the attention of some industrious pedagogue who has spent his life in the inculcation of Latin and Greek,—bring to his attention a dozen, a score, a hundred of competent classical scholars, the elegance of whose Latinity is equalled only by the vileness of their English; bring to his attention a list of those great masters of English who have boasted or bewailed their ignorance of the Classics; and do you convince him of the groundlessness of his belief? Not a bit of it! You make him angry; you give him a very low opinion of your intelligence, your education, your moral character, and probably of your parentage also; but you do not shake his belief in the slightest. Your instances roll off his mind like water off a duck's back. They are repulsed from the outskirts of his intelligence, and never get a footing within it. They are never compared with the belief at all, and therefore have no influence upon it.

Or try to demonstrate to some superstitious woman the absurdity of her belief that peacocks' feathers are unlucky. Adduce all the instances you know of people who have prospered under the shadow of peacocks' feathers; it is all to no purpose. "It is no use talking to me," she very truly says. "When Susan had rheumatic fever, did she not get worse and worse as long as the peacocks' feathers were in the room, and did she not begin to mend the very day that grandmother put them on the fire?" This, you will point out to her, is *inductio per enumerationem simplicem*, and is the weakest form of that induction, since it rests upon but a single instance; and it avails nothing against the instances that you adduce to the contrary. You will make no impression upon her belief. You may as well save your breath to cool your porridge. Your instances do not engage her attention; she flouts them; she disregards them. It is not that they are disbelieved; they are ignored. They never enter her mind. They never come into contact with the belief at all; and therefore they have no effect upon it. In this case also, the vagueness of the belief, and the misinterpretation of events, help in its preservation. Let her live in a house decorated with peacocks' feathers, and she will be in constant fear of misfortune; and, since no life is free from misfortune, every calamity that happens, from the breaking of crockery to the death of her children, will be imputed in some degree to the peacocks' feathers. Be it argued that her neighbour, who has no feathers, is far more unfortunate; it goes for nothing, since peacocks' feathers, unlucky though they be, are not the only unlucky things in the

world. Her neighbour may have been born unlucky, or, who knows? may be in the habit of cutting her nails on Sunday. If, in spite of all, she has a run of luck; if her household thrives, her husband prospers, her son gains a fellowship, her daughter makes a happy marriage, and she herself receives an unexpected legacy, yet all this good fortune might have been enhanced had it not been for the peacocks' feathers. Here again, the vagueness of the belief prevents the occurrence of any experience that is actually contradictory, and experiences that are merely contrary go for nothing.

Supposing, however, that we are successful in compelling attention to the experience, and that it really is taken up into the mind and compared with the belief, it by no means follows that the belief will perish at its touch; and this, of course, is particularly the case with beliefs that are held to be generally but not universally true, and with beliefs whose complete contradiction in experience is impracticable. Probably if they were interrogated, few yokels would be found to suppose that the cock sounds his trumpet precisely as the clock strikes. It is somewhere about the hours named that he sounds his clarion, and any time within half an hour one way or the other would be looked upon as congruous with, and confirmatory of, the belief. The belief is vague. In this case also it is not the experience *per se*, but the experience as interpreted, that influences the belief. The belief is already in possession of his mind, and when he wakes in the night and hears the cock crow, he says to himself, "That is the first cock," or second cock, as the case may be. He does not look at the clock. Indeed, when the belief arose, he had no clock by which to test his belief. He assumes at once on hearing the bird, that it is either midnight or 3 a.m., and this assumption is his interpretation of the experience, and goes to strengthen and confirm his belief. But lastly, supposing that you compel him to keep awake all night in a region of farmyards, and demonstrate thereby that the noisy bird vociferates at irregular intervals all through the night, will you thereby convince him of the error of his belief? By no means. That, he will tell you, was a very exceptional night. The moon was so bright that the birds mistook her light for sunrise. Or some birds of a new breed had recently been imported into the neighbourhood and set a bad example, which misled the others. And especially, as there were a good many outbursts between 11.30 and 12.30 and between 2.30 and 3.30, his attention and memory will be engrossed by these, to the neglect and exclusion of the others, and he will triumphantly

maintain that the experiment is confirmatory and not destructive of his belief.

But even when experience is directly contradictory of a belief, the belief is not necessarily destroyed, as is evidenced by Tertullian's *credo quia impossibile*, and by experiences that are familiar to most of us. As a little boy I had a rooted belief when I was in a dark room that I was in the presence of a wolf. I knew perfectly well that there had been no wolves in England since the time of Egbert, and I *knew*, in a sense, that the belief was absurd. I was thoroughly familiar, of course, with my own bedroom, and knew perfectly well every object that it contained, and was even accustomed to search it before I went to bed, and so to make sure of its contents. So long as the candle was burning, the belief was absurd; but the moment the candle was out, the wolf was there. The belief persisted in spite of contradictory experience. Most seafaring men believe with settled conviction that whistling brings wind, and I have myself been cuffed and sworn at, when a boy, for whistling in a gale of wind. In the days of sailing ships, multitudes of seafaring men had experiences directly contradictory of this belief—were becalmed for days and weeks in the doldrums, and remained becalmed in spite of the sibilations of the whole crew;—and yet the belief persisted, and persists to this day. I have seen a boy, with a fifth of November mask, experiment on his young sister, a child in arms. Every time he put the mask in front of his face, the child evinced signs of terror, and cried; the moment it was removed and held beside the face, she laughed. The mask was turned round, that she might see its emptiness; it was given into her own hands and examined; but the moment her brother put it on again, she screamed with terror. The belief in the reality of the hobgoblin was not dissipated by the contradictory evidence of the child's senses, that it was merely a mask that could be donned and doffed at will.

The same persistence in belief in the teeth of experience is seen in the instances, of which history is full, of continued faith in exposed impostors. From Paracelsus to the Tichborne Claimant, from the Tichborne Claimant to Madame Blavatsky, we see the retention of faith in spite of contradictory experience.

Thus, a coherent belief, once established, is, as history shows, extremely difficult to destroy; and its destruction, as will be shown hereafter, is a painful process; and it is well that it should be so. For belief is the foundation of conduct, and, if beliefs have little cohesion,

conduct has little consistency. It is manifestly important that ways of meeting circumstances which have been found effectual should be continued, and this continuity of conduct can be secured only by continuance of belief. If we had no beliefs, conduct would be altogether at random, and our welfare and very existence would be jeopardised. It is expedient, no doubt, that a belief which is inconsistent with experience should be abandoned, or modified so that it is brought into congruity with experience; but it is important that beliefs should have considerable stability, and should not be very readily modified or abandoned, and this for two reasons. One of these has been given. It is manifestly better that conduct should be consistent, should be based upon some uniform principle, even if that principle is erroneous, than that it should be altogether at random; for conduct based upon belief will of necessity bring experiences which have a direct bearing on the belief, and will either agree with and confirm it, or will conflict with, and so in time destroy it. If beliefs are lightly abandoned upon the first experience that appears to be inconsistent with them, the true will go with the false, and the slow process of bringing belief into conformity with external relations will never begin, or rather, will be always beginning and will never progress. It is to be remembered that beliefs are, and must be, tested by experiences *as we interpret them*, and it is scarcely too much to say that the majority of our experiences are wrongly interpreted in some particular. Now if the erroneous interpretation of experience enables us, as we have seen, to bring experience into an apparent harmony with beliefs that are false, it equally enables us to bring experience into conflict with beliefs that are true, and as it is more important that we should cherish correct beliefs than that we should discard those that are faulty, it is more conducive to our welfare that there should be inertia in belief than that belief should be modified by every contrary experience. But in the second place, it must always be borne in mind that man is social; that he is a member of a community; and that his nature must be interpreted from the point of view of his membership of a body politic. Now it is obvious that it is of the utmost importance for the stability of a community—the point will be dealt with at length when we come to the consideration of Conduct,—that the beliefs of the several members of a community should agree, so that their conduct may preserve that harmony which is necessary if the community is to continue. Since the experience of the several individuals in a community is various, it is evident that if

beliefs were easily changed, their beliefs also would be various; their conduct would be inharmonious, and the bond of union of the community would be loosened. Hence we see another teleological reason for the persistence of belief; and this being so, it is evident that natural selection will secure the desired condition; and that it has effectually done so, history plainly shows. It is evident, moreover, that if it were desirable to secure the persistence of beliefs in the teeth of conflicting experience, the simplest and most direct method of attaining this end would be to provide that the conflicting experience should not be attended to, and this appears to be the means that is in fact operative.

Thus it seems that when Mill saw that the greatest of all causes of non-observation was a preconceived opinion, he was expressing the same conclusion that we have reached, viz. that the inconsistency of experience with belief is not necessarily destructive of the belief. No doubt, the more directly contradictory the experience is, the more destructive is it of the belief which it contradicts; and the more numerous the instances of incongruity, even when the incongruity does not amount to contradiction, the more is the belief undermined; but the destruction of belief by experiences that are incongruous with it is usually a slow and gradual process, and is not always effectual.

We have seen that there are three chief ways in which beliefs arise, or three bases upon which beliefs may rest. They may arise directly from experience; they may be founded upon testimony; or they may rest upon authority. Beliefs that arise out of experience are easily destroyed by contradictory experience, as when the belief in a man's honesty is destroyed by his detection in stealing, *flagrante delicto*. They may be destroyed, though with difficulty, by authority, as when the heliocentric theory is substituted for the geocentric in children nowadays; or they may be destroyed, though with much greater difficulty, by testimony, as when the same change was effected in the seventeenth century. Beliefs that rest upon authority are impenetrable to unauthoritative testimony. They may, though with great difficulty, be destroyed by experience, either directly contradictory, or by the accumulation of contrary experiences; but the most effectual method of their destruction is the destruction of the authority upon which they rest. This was well known to the early missionaries, who did not waste time in arguing with the heathen as to the impotence of their idols, but who set to work and pulled down the idols from their

places and broke them in pieces. The last class of beliefs consists of those that are founded upon testimony, and these are easily destroyed by the contradiction or contrariety of either experience or testimony.

These, then, are the ways in which, whether erroneous or correct, beliefs may normally arise and be normally destroyed; but there is a fourth class of beliefs which are abnormal, and are termed delusions; beliefs which may or may not have some foundation in experience, in authority or in ordinary testimony, but which, however formed, are entirely indestructible by any or all of these agents. In considering beliefs of this class, there are evidently two things to account for, first the formation of the thought, or the establishment of the mental relation, and second the maximal cohesion of this relation, which converts the thought into a belief.

The first part of our task has already been attempted. Though we cannot explain, we can parallel the formation of these often bizarre and astonishing thoughts, that are met with in delusion, by thoughts of very similar character that are formed under normal circumstances and in normal minds. The habits of conjecture, of hypothesis, castle-building, and reverie, are entirely normal, and are familiar in the minds of all. It has already been pointed out that conduct rests upon belief, and that ways of dealing with circumstances depend entirely upon our hypothesis or belief as to what the circumstances are. When certain localised and specific impressions of sight and sound are made upon our senses, we immediately interpret these impressions in the light of past experience; we combine them with memories of previous impressions; we form an hypothesis as to the circumstances to which they correspond; and we regulate our action upon this hypothesis. In the present case, the hypothesis is that the circumstances are an approaching horse and cart; and upon this hypothesis we determine to get out of the way, and act accordingly. Every act, all our conduct, the regulation of every waking moment, is based upon the formation of hypotheses, which partake in greater or less degree of the nature of beliefs. Our existence from year to year, from month to month, and from moment to moment depends upon this process; and hence, the instant that any impression is made upon us, we begin to form an hypothesis as to the circumstances which correspond with the impression. The newer, the stranger, the less familiar the impression, the wider the range of hypothesis, the greater the scope for what is called fancy, that is for bringing together thoughts that have hitherto been

widely separate. But though impressions cannot be received without the instant formation of an hypothesis with regard to them, the impress of circumstances is by no means necessary to the formation of hypotheses. The same process still goes on to deal with memories that arise spontaneously in the mind, and with newly established combinations among these memories. The formation of these hypotheses, and of deductions from them, are the processes that we know as conjecture, imagination, fancy, castle-building, day-dreaming, reverie, etc., and are as normal as the process of perception itself. When a person feels a new and unaccustomed sensation of, say, prickling and tingling, it is natural, normal, and inevitable that he should instantly form an hypothesis as to its origin, and according to his past experience, so will the nature of the hypothesis be. One man will attribute it to pressure on an artery, another to irritation of a nerve, a third will conjecture that it is an electric shock, a fourth will suppose it due to witchcraft. Some hypothesis he must form. What this hypothesis will be, will depend upon his knowledge and experience. And in the absence of sense impressions which compel attention, the same process will still occur in active minds that are not otherwise occupied. If a man is not engaged in ordering his conduct in actual circumstances, his mind will occupy itself in ordering his conduct in hypothetical circumstances. The poor man will settle what he would do if he were rich, the rich man how he would manage if he were poor; the religious enthusiast will try to picture the joys of heaven, or perchance will meditate upon the pains of hell; the inventor will let his imagination ramble among appliances that he sees to be desirable but knows to be impracticable; Johnson, at Boswell's instigation, settled what he would do if he were shut up in a tower alone with a baby; Sir James Mackintosh is said to have imagined himself Emperor of China; Charles Lamb invested himself with imaginary wife and children; Sir Thomas More lived good part of his life in Utopia; and every novelist and dramatist lives among his characters, sees their faces with his mind's eye, hears their voices, notes their gestures, is eye-witness of their joys and griefs, their perplexities and triumphs. Every one of these persons is doing exactly what the victim of delusion does when he first shapes to himself the form of his delusion. He is hypothetising; he is imagining; he is making believe; he is exercising his fancy; he is romancing. The process is absolutely normal.

It is the second factor in delusion that most requires explanation.

The difference between such fancies as have been mentioned and true delusion lies, not in the mode of their formation, but in the cohesion that the relation assumes after it is formed.

We have seen, in our discussion of the normal, that there are five degrees or categories that can be distinguished in the cohesion of mental states, viz. the Inconceivable; the Conceivable but Incredible; the Credible, with its various degrees of Likelihood and Doubt; the Relatively Certain, or Fact; and the Absolutely Certain, or True. The concepts with which we deal may belong to any of these categories, and under the influence of experience, direct and indirect, our concepts are constantly being transferred from one of these categories to another, and up and down the middle category through the most various degrees of likelihood and doubt. Thus, what we believed to be inconceivable becomes conceived, the incredible becomes credible, becomes likely, becomes fact, becomes true; and similarly in the reverse order, what was believed to be absolutely true becomes relatively true; what was fact becomes doubtful; what was doubtful becomes unlikely, becomes incredible—inconceivable. Any of these transferences may be, and most of them frequently are, effected by the influences which we have already found to be determinative of belief, that is to say, by the influence of experience, of testimony, and of authority. But no transference of belief from category to category can normally be effected by the mere interior operation of the mind itself, unaided by commerce with circumstances. If the accepted Truth, that the sun goes round the earth, becomes shifted from the category of Truths to that of Facts; becomes undermined by insidious Doubt; sinks down the category of Likelihood till at length it is received into the Incredibles; and makes its final resting-place among the Inconceivables, it is not alone by any intrinsic mental process that the transference is effected. It can be effected only by laborious observation, calculation, and experience of circumstances; or else by overwhelming authority. Without extrinsic aid the transference cannot be effected. Except in so far as some influence may be exerted by the classification of its concepts, the mind by itself can do nothing without appeal to experience, direct or indirect; and as we have seen, even definite experience is not always speedy or certain in its action.

So with the next class of thoughts, those which are conceivable, but incredible. However the stage of belief has been attained, at this stage it will remain until it is altered by the action upon the mind of

circumstances external to it. I can conceive a liquid diamond, but I cannot believe that such a substance will ever come within the purview of my own experience, unless and until either that actually happens, or I am informed upon credible testimony that it has happened to someone else. By no effort of my own mind, unaided by evidence from without, am I able to transfer the thought of liquid diamond from the category of the incredibles to that of the credibles. And similarly of the transition from credibility to truth. If I read in the newspaper that the cuckoo has been heard on a certain date, or that an unusually large gooseberry has been picked, I at once relegate the concept to a certain category. I regard the circumstance as credible, and apportion to it a somewhat vague degree of likelihood or doubt. I have no difficulty in establishing the thought in relation to my experience, and I have little difficulty in dissociating its terms in the same relation. From this category of credibility, but uncertainty, I cannot of my own mere motion remove the concepts. I can neither regard them, on the one hand, as wholly incredible, nor on the other, as certainly true. For either of these changes of category to take place, it is necessary that some influence should be exerted upon the mind from without. There must have been some additional experience or some additional testimony. The unaided mind is powerless to effect a change.

Now it is this very change of category, it is the transference of a concept from one category of belief to another by the unaided operation of the mind itself, that occurs in delusion and that constitutes delusion. Delusion consists, not in the formation of a concept, however absurd, for did it so, every writer of fairy stories, nay, every reader of fairy stories, would be deluded. It consists in the removal of a concept from one category of belief to another by the unaided working of the mind itself, and apart from the impress of circumstances, from appeal to experience, and from the influence of testimony, Delusion consists in regarding that as true or as fact which experience warrants us in placing in some lower category only—regarding as doubtful or incredible or inconceivable. And it is not transference in this direction alone that constitutes delusion. The transference from category to category may take place in either direction, and the downward transfer, though less common than the upward, is an equally well-established occurrence. Transfers in this direction result in our regarding truth and fact as merely credible—as doubtful—or as incredible, or even inconceivable. While transfers in the one direction constitute ordinary

delusion, those in the opposite sense constitute the occurrences of *folie du doute.*

It is easy to conceive existences and events of ordinary, and indeed of very extraordinary character, and however extraordinary and opposed to experience the existence or occurrence may be, there is nothing abnormal in the process so long as the concept is referred to its proper category among beliefs. I can imagine that my frequent visitor, Robinson, is now walking up to my front door. It is about the time at which he makes his visits, and there is nothing incredible or unlikely in the concept; and so long as I retain it in its proper place among the credibles, and apportion to it its due degree of likelihood as warranted by experience, so long the whole process is normal. But if, without the warrant of experience, I transfer the concept to a neighbouring category, and place it among the "facts"; if I actually believe, if I am certain that Robinson is on the path between the gate and the door, then at once the boundary of the normal is overstepped, and then I am subject to delusion. It makes no difference to the character of the belief even if Robinson did happen to be in that place at that moment, provided that his presence there is not a matter of experience to me. All that my experience warrants is that his presence there is credible and even likely, but if I regard it as certain I am deluded. So, I can conceive that a meteorite in the shape of a bust of Socrates has fallen in my garden; I can conceive that my cat has grown eight additional tails; I can conceive a pig with the head of a turkey; and so long as these concepts remain in their proper position among the incredibles, so long they are entirely normal. But if I transfer them into a category for which my experience gives no warrant; if I regard them as possible; still more if I look upon them as likely; and yet more again if I regard them as facts, I at once overstep the boundary of the normal, and find myself in the region of delusion. Lastly, if I should transfer a quasi-concept which is normally inconceivable—such a concept, for instance, as that of officiating at my own funeral—to a higher category, and regard it as conceivable, as credible, or as true, the transfer would constitute delusion.

Nor is it only upward in the scale that the transfer from category to category can be effected. We have seen that normally, that is, by the aid of experience, concepts can be, and often are, transferred from a category of more cohesive to a category of less cohesive concepts; that which was once regarded as true becoming doubtful, the credible be-

coming incredible and the conceivable inconceivable. The same transference in this, the reverse direction, may be made by the unaided operation of the mind in the absence of relevant experience. A person locks a door or a drawer, or puts a screen in front of a fire, and immediately thereafter the belief that that action has been performed is absolutely cohesive. It is a "fact," and remains so as long as the memory of the act remains faithful. But there are persons whose minds fail to retain such beliefs in their proper category. No sooner is the act performed than they begin to doubt whether they have performed it or no. Doubt is introduced. The concept is transferred from the category of fact to the middle category of credible, but doubtful, and to reinstate it in its proper category recourse must be had to experience; the act must be gone through again; the door locked, the watch wound, the screen put in front of the fire, or what not; and perhaps even after this appeal to experience the transfer will take place again, and the concept slip back into the category of the doubtfuls. The transfer may go a stage further, and may remove the concept from the category of fact through that of doubtfulness into that of actual incredibility. This again is delusion, or is the complement of delusion. A person under morbid apprehension is full of the fear of impending disaster. He is sure, he is convinced, that he will end his days in the workhouse, that he will stand in the dock and receive sentence of penal servitude. The assurances of his friends and the consensus of his experience, which shows that he is solvent, that he is wealthy, that he is innocent, all go for nothing. All of them were "facts" to him before his illness; all of them are now removed from the category of facts to that of incredibles; and as this transfer has taken place by the unaided working of his mind, without the support, and indeed, in defiance of the opposition, of experience, it constitutes delusion. It is obvious that in every transfer of concepts from one category to another, the transfer must be a double one—that when a concept from being fact becomes incredible, its negative, from being incredible, must become credible; and it is this complementary aspect of delusion that we have now reached.

The view which regards delusion as the transfer of a concept from one category of belief to another without recourse to experience, or as a change in the degree of cohesion of thought under the same circumstances, has this incidental advantage, that it provides us with a standard by which the degree of divergence of beliefs from the normal

can be approximately measured. To the student of delusions it is obvious that some delusions are of a much more exaggerated and outrageous character than others, and involve a much wider departure from the normal; but it has not been possible, by any reference to a standard, to predicate by how much one delusion was a wider departure from the normal than another. By the view of delusion here proposed, a measurement can be taken; a measurement which is not, indeed, rigorously precise, which estimates delusions rather by handfuls than by minims or grains, but still a measurement of some kind, and therefore an advance from the position in which no standard at all of the gravity of delusion was available. It is evident that if delusion is the transfer of concept from category to category in the scale of belief, then the magnitude of the delusion, or the degree of its departure from the normal, may be gauged generally and approximately by the number of categories passed through, or by the distance upon the scale of belief that is traversed. According to this mode of measurement, the attachment of some degree of credibility or likelihood to an incredible concept would be a delusion of less magnitude than the conversion of an incredibility into a believed "fact"; this again would be less grave than the transfer from inconceivability to "fact"; and the gravest possible departure from the normal would be the transfer from positive to negative inconceivability.

These proposed divisions represent no mere academic and unpractical distinctions. The classes of delusion that they demarcate are clinically recognisable; and not infrequently we can witness the gradual transfer of a delusion from class to class, as the malady becomes more profound or confirmed on the one hand, or on the other as it passes away. Dr. Hack Tuke has recorded a case in which a man conceived, what he admitted and protested was the absurd idea, that he was pregnant. The case at this stage was of the lowest degree of delusion; the concept was transferred but a single step or degree in the scale. It passed from the inconceivables to the conceivables but incredibles. As time went on, the transfer proceeded, and gradually the patient began to entertain doubts as to whether, after all, there might not be something in it, whether, after all, he was quite sure that he was not pregnant. The delusion had gained another step. It had passed from the class of incredibles into the doubtfuls. Week by week and month by month the cohesion of the relation increased; its likelihood, at first minimal, grew and grew, until at length it entered the

class of "facts." It was looked upon as certain, and was fully established as what is ordinarily termed a delusion. We see the same process of transference in the opposite direction not very infrequently when a delusion is abandoned on the recovery of a patient from insanity. He is a wealthy man who has conceived that he is ruined, and without warrant from experience has transferred this concept from the class of incredibles to the class of "facts." As he recovers, we see that his belief begins to be attacked by doubt. It is slowly lowered in the scale as the doubts become more and more pronounced, the cohesion of the concept loosened more and more, until at length it is not only dissolved, but cannot again be united in relation to the experience of the patient. It passes from the category of "fact" to the category of doubtful but credible, and out of this again it passes into the incredibles.

Has this measurement of the degree of magnitude of a delusion any correspondence with the gravity of the delusion in the sense of its irrecoverability? I do not think that there is any very close correspondence, but I think that there is a correspondence. Those delusions which begin at the extreme end of the scale, delusions in which the inconceivable becomes quasi-conceivable, credible, and believed, or in which the conceivable becomes inconceivable, doubtful, and incredible, are almost always irrecoverable. I know of no case in which a delusion of double personality, of living in the fourth dimension, of doubt or incredibility of the simple truths of arithmetic, as that two and two make four, of attending one's own funeral, or any other case of the adoption as true of an inconceivable quasi-concept, has recovered; nor on the other hand of the recovery of any case in which a "necessary truth," a concept of which the negative is ordinarily inconceivable, has been doubted or denied. There is, I think, no case recorded of recovery from the delusion of doubt of one's own existence, of disbelief in the reality of the universe or other necessity of thought. Furthermore it is apparent, from the stages that one can often witness in the establishment of, and recovery from, delusion, that those delusions whose scope covers the change from one category to the next only, are less extended departures from the normal than are those delusions in which the change is from one category to the next but one or the next but two; but here it must be admitted that the actual extent of the change is much less important to our prognosis than in the direction in which the change is proceeding. That is to say, the

vital factor is whether the change is proceeding towards the normal or away from it.

Of course, the classes, at any rate the intermediate classes, are very large, and comprehend very wide ranges of departure from the normal within the limits of each. In the middle category, for instance, there are many degrees of doubt and of likelihood, ranging from the nearly incredible at one end to the nearly certain at the other; and as we have already seen, even among incredibles and the "facts" there are degrees of incredibility and degrees of certainty. What is true of progress from class to class is true in its degree from step to step within the class. The certain belief in a thing that is normally more incredible is a greater departure from the normal than the certain belief in a thing that is less incredible; and the degrees of certainty with which the belief is held have also to be taken into consideration. Ordinarily, delusions do not remain long in the middle category, of doubt, likelihood, and uncertainty; when they do so remain, they usually come from the side of certainty, and belong to the class of *folies du doute*. When coming from the direction of incredibility, they do not often remain in the category of uncertainty, but pass through it into that of affirmative certainty.

In thus regarding delusion as the transference of concepts from category to category by the unaided action of the mind, working apart from experience, we seem to have reached a position incongruous with that of modern pathology, which looks upon all morbid process as resting ultimately upon defect rather than upon excess of action. We can conceive that, by the action of morbid process, structure is damaged, function lowered, capacity diminished, ability impaired; but it is contrary to our concept of morbidity to suppose that, by any morbid process, structure can be improved, capacity increased, function raised in efficiency, ability enhanced. There is some force in this objection, no doubt, but I do not think that it ought to weigh against the manifest advantage of the view here taken. It is seldom that a morbid process produces a state of simple defect, altogether uncomplicated with what appears to be excess of action. Even paralysis from destruction of nerve tissue is associated with rigidity; and that a process essentially morbid can produce an apparent enhancement of function is evidenced by other occurrences in the nervous system. It is evidenced by the excessive muscular contraction of epilepsy, by the temporary mental brilliancy of the early stages of alcoholic intoxication, and by the

temporary enhancement of bodily "condition" and capacity in the early stages of general paralysis. In the case of delusion that we are now considering, defect is mingled with excess in the same intimate mixture to which we are accustomed in morbid processes; for not only is the concept shifted from category to category by the unaided working of the mind, which we may regard as function in excess; but at the same time it becomes impossible for experience to restore the concept to its proper category. Not only does the belief become spontaneously cohesive without the welding influence of experience, but its cohesion is such that contradictory experience of the most striking character altogether fails to dissolve it.

Granting that the true nature of delusion is the spontaneous alteration of the cohesion of a relation without the aid of experience, the next question that confronts us is that of the pathology of this process. How does it come about that the cohesion of concepts is thus altered? What is the process by which a concept is shifted from one category of belief to another without the aid of experience? Of what normal process is this morbid process the travesty or the exaggeration? To these questions, which are different ways of putting the same question, we cannot at present furnish any complete answer, but we can recognise the direction from which the answer will eventually come.

In the first place we have seen that even in the normal, experience is not the sole source of our beliefs. Experience is not the sole factor that determines in what category of belief a concept is to be placed, nor is it the sole factor in maintaining it in its position. We have seen in our examination of Expectation, that the category to which a concept is relegated depends, in many cases, upon the innate constitution of the mind as much as upon the experience to which the mind is subject. We have seen that a person of naturally suspicious mind will regard that as certainly an attempt at robbery, which a more generously minded person will regard as certainly, or in great likelihood, an honest mistake; that a person who is naturally timorous will be convinced of the danger of circumstances, which, to a person naturally courageous, are as certainly void of danger; that to a sanguine man it is extremely likely that benefit will arise from circumstances which, to the sober-minded, seem unlikely to be beneficial, and to the croaker will certainly be disastrous. We therefore see without surprise that, when these attitudes of mind are morbidly exaggerated, their influence also upon belief is morbidly exaggerated, and we see in another place that, in

point of time, alteration and exaggeration of emotion precedes delusion. The impotence of experience that is contrary, and even contradictory, to destroy a belief, has been shown to be by no means limited to the region of the morbid. It is very common in the normal also; and the maintenance of a delusion in the teeth of contradictory experience is thus brought into line with normal occurrences and explained, in so far as it is shown to be merely an exaggeration of what is not only normal, but frequent and regular.

Another consideration that helps us to understand the occurrence of delusion is that of the development of the categories of belief with the general development of mind. In children and in primitive man these categories are very much less extended than in the adult man of culture. In the earlier stages of mind the middle category scarcely exists, or at least exists only in rudiment. In children and in primitive man there is scarcely any suspension of judgement. The stage of doubt, of likelihood, of credibility, is extremely transient, if it exist at all. A concept is either believed or disbelieved; it is either certainly true or certainly false; it is either fact or fiction. It is not until a late stage of development that prolonged doubt, that suspension of judgement, becomes possible. The obliteration of the stage of doubt, and the acceptance, as true, of a concept upon a minimum of evidence, when this occurs in delusion, may therefore be assimilated to other cases of reversion during disease to a more primitive condition of affairs. It is an example of that process of dissolution in which the evolutionary process is reversed, and in which stages of development, long ago passed through and left behind, are retraversed. By as much, however, as this consideration helps us to understand the rapid transformation of a conjecture into a delusion, by so much does it obstruct our progress in the explanation of *folie du doute*. In this condition the very reverse is the case. The stage of doubt, of suspension of judgement, so far from being obliterated, is inordinately increased and prolonged, and we are reminded by it, not so much of the reversion to a more primitive state of affairs, as of those cases in which a growing structure outstrips the normal boundaries of its growth and developes to an exaggerated and portentous degree. So we see sometimes the breast of a young girl attain a monstrous hypertrophy. The two states of delusion and of *folie du doute*, while they are alike in being spontaneous transfers from one category of belief to another, are probably widely different in the process of their formation. The one resembles the anchylosis

of a joint, which destroys its use by maintaining it in a fixed position, the other is analogous to the relaxation of the ligaments which equally impairs the usefulness of the articulation by the excess of mobility which it allows.

In either case, the explanation is to be sought for, and will probably eventually be found, in a structural nervous change resembling that which upon another page is termed a parasitic mechanism. Supposing —and I am very far from putting forward the supposition as a probable or plausible one,—but supposing that the particular relation of nerve tissue which corresponds with mental relations is the approximation or contact of the extremities of different neurons; and supposing that the cohesion of a thought is determined by the adhesion of these dendritic processes, subject to separation by the flow of incoming currents derived from experience; then there is no more difficulty in conceiving that these dendritic processes may become morbidly adherent and inseparable, than in conceiving the morbid adhesion of the articular surfaces of the elbow-joint, or the serous surfaces of the pleura or peritoneum. Granted the inseparability of the material connection, the inseparability of the mental connection would seem to follow. It is, I repeat, scarcely allowable even to suppose that so crude and gross a process is the actual process with which thought corresponds, but still it is useful, merely as an illustration, to picture to ourselves such a hypothetical anchylosis of neurons. On the other hand, difficult as it is to form any clear concept of the structure of those complex mechanisms which are referred to in another page as underlying obsession, we can scarcely doubt that the occurrence of obsession is due to the activity of a definitely formed structural mechanism; and if this is so, it would seem to follow that the occurrence of *folie du doute*, which is clinically so closely associated with obsession, is owing to some similar structural peculiarity. If the cohesion of a thought be due, as we are almost compelled to think that it is due, to the formation of a nervous connection, then the undue lack of cohesion that is exhibited in *folie du doute* would seem to depend upon a morbid inability of nervous elements to maintain a connection. Whether this connection be an approximation or contact of the extremities of neurons, or whether it be of some other nature, it would at present be altogether premature to speculate, but it is at least allowable to suggest it, if not as a probable explanation, if scarcely even as a possible explanation, yet as a helpful illustration of a conceivable physical process underlying the morbid mental processes that we are considering.

Distinct from the classification of delusion according to the category from which, and to which, the transfer of the concept is effected, is a classification of more clinical interest that I proposed some ten years ago, which rests upon the department of consciousness in which the delusion occurs, and upon the mode of affection with which the delusion is associated. According to this mode of classification, delusions are primarily divided into those which are associated with pleasure and those which are associated with pain. Such a thing as a neutral delusion, a delusion which is neither pleasurable nor painful, scarcely exists, and does not exist at all as a primary state. There are, indeed, delusions with which but little pain or pleasure is now associated, delusions which once were active open sores, but which now have become tough and insensitive cicatrices; delusions which are scarcely more than forms of words which have become habitual, and which do not represent a living belief. Omitting these, as being more of the nature of stock-utterance than of delusion, we find that delusion is inseparably associated with either pleasure or pain, and that as it is the established practice to apply the term to the erroneous belief only, we really need another term to denote the compound state made up of this erroneous belief and of that affection which is associated with it. If we call this complex mental condition the "deluded state," then we can say that there is a deluded state which is affection, pure and simple, which is pain only or pleasure only, and which includes no discernible trace of intellectual delusion. Such a state belongs properly to the subject consciousness, with which it will be considered; it is very frequent indeed in the normal, and very frequent indeed in the abnormal. It is not until it reaches a considerable intensity that it attracts attention and is recognised as abnormal, and then it is commonly the prelude to delusion. Whenever the abnormal affection reaches considerable intensity, delusion is soon added to it; and delusion having once appeared, may fluctuate together with affection, but more often it becomes fixed, so that when the intensity of the morbid pleasure or pain diminishes, that of the delusion remains undiminished; and when the affection returns to the normal, it leaves the delusion behind it. In other words, the deluded state contains at the outset a large proportion of pleasure or pain, and may even, in its early stage, consist entirely of pleasure or pain; to this affection delusion is soon added, and thereafter the proportion of affection to delusion may vary much. They may subside together; the

delusion never subsides alone, leaving the morbid affection outstanding, but the reverse change is extremely common. If recovery do not take place, what happens is that the affection subsides, while the delusion remains; and this is the condition of a very large number of the chronically insane. Although the excess of pleasure or pain, out of which the delusion appeared to originate, has disappeared, the delusion remains, and it still retains to the end the colour of the affection in which it had its origin. That is to say, a belief which had its origin during a state of misery, and which reflects that state of misery in its character, as a delusion of being persecuted, or lost, or possessed by a devil, or inhabited by an animal, or what not, will still continue of the same character, will still continue to reflect the affection during which it arose, although that affection has long since subsided. Thus we find that delusions of persecution or possession on the one hand, and delusions of consequence and power on the other, may be, and very often are, entertained and cherished, while at the same time there is an entire absence of the affection which is appropriate to the delusion. This man is persecuted continually by the devilish arts of electricians or telephonists, who inject shocks into him, or twist his thoughts awry, or rob him of his manhood; and withal he is a comfortable, placid, or even jovial person, who is not in the least discommoded by the torments to which he declares he is subjected. This woman is Duchess of Europe, she is Queen of Heaven, she has a thousand husbands, and numberless millions of money, and yet she is not elated. She goes about her scrubbing, or bedmaking, or needlework, and although her exalted position imparts a certain hauteur to her manner, it does not appear to add in any appreciable degree to her happiness.

Although, however, delusions, in the course of their after history, become separated from the affection in which they arose, they never lose the colour of this affection, that is to say, the delusion which arose in misery never represents a happy or neutral state of affairs, nor does a delusion that arose during elation ever represent a wretched state of affairs; and hence, by the affection that characterises, though it may not in fact accompany them, delusions may be classified. We thus get two great primary classes of delusion—delusions of increased welfare and delusions of diminished welfare. From a speculative point of view, there should be a third class, a class of delusions that are neutral in relation to welfare, that relate to neither pleasure nor pain. It is dangerous to make an absolute statement, but so far as my own experi-

ence goes, there are no such delusions. It is true that very rarely one may find a record of a delusion in which we cannot immediately trace any direct reference to the welfare of its entertainer, as in the case of the delusion that twice two is not four, but four and a quarter; but even in this case the delusion was that of a mathematician, and so had direct reference to his life's work; and in the other rare cases in which the reference to the welfare of the deluded person is not immediately apparent, a little investigation reveals it. Practically, therefore, there are upon this basis but two classes of delusion, those of enhanced and those of diminished welfare.

Each of these classes may be again divided according as the delusion belongs to the subject-consciousness, to the subject-object-consciousness, or to the object-consciousness. Those of the subject-consciousness pure and simple are not in the strict sense of the word delusions at all. They are "delusional states" in which there exists disorder of affection alone without concomitant delusion. They are states of depression and misery on the one hand, or of elation and happiness on the other, which are not justified by the actual circumstances of the individual, and which do not even receive a quasi-justification from delusion as to what these circumstances are.

Delusions of the subject-object-consciousness are those, of course, which refer not alone to the self in the sense of the metaphysical Ego, of the Subjectissimus, but to the self as personality,—to the self not as mind only, but as mind-body, and this class includes several subclasses. It may be divided first, into delusions as to the whole personality, and delusion as to the physical part only of the personality, that is to say, of the body. Delusions as to the whole personality are not common, but many cases have been recorded. They fall naturally into two groups.

The first group consists of those cases in which the two personalities coexist, as when a man in some incomprehensible manner believes that he is duplicated, and that either there are two selves in one body, or that he is two distinct personalities, and goes about seeking his double. Such cases are very rare.

The second group consists of those in which the two personalities alternate; a person, after some crisis, such as a hystero-epileptic attack, waking with a changed disposition and character, and a forgetfulness, not only of his past life, but it may be of many of the accomplishments and acquirements of his past life, requiring, it may be, to

be reinstructed in reading and writing. After a few days, weeks, or months of this life, another crisis takes place, after which the previous personality is restored, and the experiences of the alternate life-history are obliterated until the next alternation. Incredible as such occurrences appear, a sufficient number of well-authenticated instances, from different countries, have occurred, to place them beyond reasonable doubt.

Such disorders of consciousness are not ordinarily termed delusions, and would be more appropriately termed delusional states, since there is more than mere alteration of belief in them. The morbid change includes not only that which is believed, but that which believes; not only the object-consciousness but the subject-consciousness also, and is thus far more extensive than delusion as ordinarily and properly understood. It is in connection with delusion, however, that they can only be properly dealt with. Each includes delusion, though it does not consist wholly of delusion, and thus falls to be considered here. With the next group we begin the consideration of delusions ordinarily so termed, but in these again the delusion, the erroneous and incorrigible belief, is not the only morbid change in mind. It is commonly associated with a change of affection, which, added to the alteration of belief or delusion proper, makes up the delusional state.

Delusions as to the body—the material part of the personality—are very much more common, and may refer either to the whole body or to part only. To the first sub-group belong delusions as to the material composition of the body—that it is made of glass or iron, or what not, or that it has become immaterial or empty; while delusions as to part of the body are those in which the patient believes that some portion is removed, or changed, or that something has been added. Thus one believes he has no back to his head, another that his bowels are obliterated, another that he is pregnant, or that his sex is changed, another that he has a worm in his head, a weasel in his stomach, that his legs are made of paper, and so forth. In very many cases of delusion as to part of the body, there is found some actual structural alteration of that part, and no doubt the altered sensations referred to the part are the occasion of the localisation of the reference of the delusion. Thus, patients who deludedly believed that their bowels were stopped, have been found to have suffered from ulcer of the ileum; a patient who believed that he had a tapeworm in his head was actually found to have cysticercus in his brain. Patients

with crabs or devils in their stomachs suffer from dyspepsia, and so forth.

Delusions of the object-consciousness fall naturally into two groups: those of increased welfare and those of diminished welfare, and each of these groups is further divided according as the delusion refers to the relation of self to the surroundings or to the relation of surroundings to self.

Delusions of increased welfare of the relation of self to surroundings commonly occur in conjunction with delusions of increased welfare in the relation of surroundings to self; the academical distinction does not tally with any distinction in the clinical picture; the same individuals entertain delusions of the two groups at the same time, and consequently the group of delusions of increased welfare in the relation between self and surroundings may be considered as a whole. It consists, on the one hand, of delusions of increased bodily or mental capacity of the most various degree, of wealth, of power, of consequence, of influence, of position, of rank, etc. Individuals affected with such delusions ascribe to themselves exaggerated and even impossible qualities. They are rich far beyond the dreams of avarice. They are wealthy enough to make every living human being a millionaire, or perhaps their possessions extend only to three acres and a cow. They are dukes, kings, emperors, lords, gods, or perhaps even Lord Mayors. They are married to five hundred wives, all duchesses; they have children, a dozen, a score, a hundred, a thousand. They have written more books, more learned books, more able books, than any other writer. They can walk further, run faster, jump higher, make more runs at cricket, more goals at football, they can ride better, they have won more races, seen more foxes killed, than any other human being. And together with these delusions of increased welfare of the relations of self to surroundings go delusions of increased welfare in the relations of surroundings to self. Persons who entertain delusions of the class just described, entertain at the same time delusions that honours and wealth have been, or are about to be, conferred upon them, that they are to be elected to Parliament, that the Almighty distinguishes them by His special favour, that the saints or the Virgin Mary make flattering communications to him, that he is invited to dine with the King, or to take tea and shrimps with His Majesty. Delusions of this second variety of the grandiose class are much less common than those of the first; they occur in the same individuals as those

of the first and are concurrent with them. Consequently the two groups of delusions are usually regarded as but a single class, which clinically they are, and are included together in the term grandiose delusion, delusions of grandeur, delusion of exaltation, or megalomania.

The second sub-class of delusions of the object-consciousness, viz. that of delusions of diminished welfare in the relations between the self and the surroundings, is similarly susceptible of division into two sub-groups upon the same principle as the last, one sub-group consisting of delusions of diminished welfare in the relations of surroundings to self, the other of diminished welfare in the relations of self to surroundings; but unlike the subdivisions of the previous group, those of this group are distinct not only academically but clinically, and characterise two clearly distinguishable classes of cases of insanity.

Delusions of diminished welfare in the relations of self to surroundings are especially and emphatically the delusions of melancholia. They are the self-accusatory delusions; the delusions of personal unworthiness and of personal inefficiency; of sin and crime and vice on the one hand, and of impotence and inability and incapacity on the other. Persons affected with delusions of this class abandon themselves to despair because they have committed the unpardonable sin, or give themselves up to the police as the perpetrators of crime, or accuse themselves of various wickednesses of greater or less enormity. They believe that they have brought themselves to ruin, their wives and children to poverty, that they have mismanaged their own affairs, and damaged the fortunes or the prospects of others. There is no solace for them in this world and no hope in the next. Such is the condition of those in whom delusions of this group are fully developed; but lesser degrees are also extremely common. It is extremely common to meet with delusions of sin which is not yet unpardonable, of ruin which is not yet irretrievable, of inefficiency which is not complete. All these delusions may exist in the most various degree and in the most varied combinations, but all are reducible to the two categories of unworthiness on the one hand and inefficiency on the other, corresponding with the two fundamental categories of passion and action.

Delusions of inimical relations of surroundings to self form a very well characterised sub-group of delusions, very distinct from the last, and include the delusions of persecution, of suspicion, and of con-

spiracy. To this class belong the whole group of what are termed systematised delusions, that is to say, delusions by which the deluded person makes for himself a new environment, containing some malign principle to whose operation the causation of events is referred, an environment from which existences and events that are indifferent to, or unconnected with, the deluded individual, are little by little excluded, until at length there remains on the one side a self with which alone the universe is concerned, and on the other hand a universe, the expression of some malign principle, directed solely against the swollen and bloated self upon which it is centred. When this stage is reached, everything that exists, exists but to annoy or injure the deluded individual; every event that occurs, occurs solely for his detriment. The people who are talking on the other side of the street are talking about him, are speaking evil of him. The children laughing and screaming at their play are screaming with derision of him. If there is a political meeting reported in the papers, the speeches, under the cover and pretext of political debate, were really directed against him. The very horses and cattle are in the service of his enemies, the wind in the trees murmurs only to annoy him. The world is one vast conspiracy to depreciate, belittle, and injure him. The principle or influence, in which the antagonism to himself originates, may be personified or may not. It may reside in some definite individual of his acquaintance, or it may be in some prominent personage with whose name or office he is familiar, as the Sovereign, the adjutant-general, or the Lord Mayor; or it may be some mythical individual, as in a case related by Dr. Conolly Norman of a wholly illiterate woman who was persecuted by two wizards named Harry Stottle and Leger-de-Main; or as in a case under my own care, in which the persecuting being was an imaginary Frenchman named Girardot. Very frequently the adverse influence is impersonal, and in that case is just now most frequently electricity, but at any time it is that agent whose mode of operation is least understood, and which happens at the time to be most talked about. Thus for many ages it was witchcraft, and many and many a wretched old woman has been "convicta et combusta" upon the accusations of persons afflicted with delusions of this class. In the early part of last century it was steam; fifteen years ago it was telephones; and at the present time it is frequently the Röntgen rays or wireless telegraphy. Often it is some new principle as mythical as Harry Stottle or Girardot. It is a "system of vibration," it is a "hypnotic network," it is "chemical

vapours," it is, as in cases of Dr. Norman's, a "typhone," or a "hypophone." Very often even this degree of definiteness is wanting, and all that can be gathered from the sufferer is that there is something that he cannot explain and does not understand; it is something to do with Revelation and the Great White Throne; it is something to do with the Royal Family; it is mixed up with the Beast with seven heads and ten horns; the German Emperor is in it, and so are Darwin and the Tichborne Claimant; there are wheels within wheels, and serpents twining in and out amongst them; it is all mist and fog and muddle; but it is very actively pernicious, and it makes his life one long misery. Delusions of this class are of special importance from their influence upon conduct, since they so frequently prompt to crimes of violence.

While the groups of delusions that are here described are all well characterised groups clinically, as well as from the point of view of their pyschological nature and constitution, they have of course no absolute clinical separateness in the sense that delusions of different groups never occur in the same individuals at the same time. The puffed and bloated self of the last class of delusions has a manifest affinity to the aggrandised self of the exalted delusion; and in fact the two are not very infrequently combined. As Dr. Norman points out, a patient will say that he is the child of noble parents, the heir to great wealth, and that he is cheated, tormented, and imprisoned on that account; or that he is a prophet or a saviour tortured by the wicked and tempted by fiends. On the other hand, although these delusions of persecution have a manifest likeness to the delusions of melancholia, in that they are both of an unpleasurable cast, and both involve an exaggeration of the importance of the self in the scheme of the universe, yet the two are scarcely ever combined. The paranoiac never presents the conviction of personal unworthiness and incapacity of the melancholic, and the melancholic never declares himself to be punished in excess of his deserts. The melancholic does indeed very often imagine that some horrible punishment is to be inflicted upon him, that he is to be murdered, or cut into bits, or starved, or what not, but with this idea of punishment the idea of injustice, which is so prominent in the case of the paranoiac, does not seem to be ever associated. He dreads his fate with superlative horror. He is anxious to kill himself rather than to suffer it; but he never protests against it as undeserved. While the grandiose delusion of exaltation is the very antithesis of the delusions of melancholy, there is yet in the latter an evident element of

grandiosity. There is manifest conceit in the notion that I am the greatest of sinners; that my country is to be invaded and conquered, my countrymen enslaved, or perhaps the whole human race everlastingly damned, on account of my particular unworthiness.

We find, therefore, that while there are wide and valid distinctions, both clinical and systematic, among the various groups of delusion, there is at the same time a link which connects them all together, and prevents the distinction from being in any case absolute; and that this feature, which is common to all forms of delusion, is the cloudy swelling of the Subject—the exaggeration of the importance of the self in the scheme of the universe.

VOLITION

The organism not only receives, but emits motion. With the reception of motion certain mental states occur correspondingly. With the emission of motion certain other mental states occur correspondingly. We have now to shift our point of view from the surface of the body—from the peripheral endings of the nerves—to the central focus of the bodily energy. We have to regard the commencement and origin of the emission of motion from its primitive source in the most secret recesses of the organism—the highest nerve regions. With the reception of motion by the highest nerve regions occurs the corresponding mental state of Sensation; with the emission of motion from the highest nerve regions occurs the corresponding mental state of Attention.

Motion is emitted from the organism under two conditions. The incidence of motion upon the organic body, like the incidence of motion upon the inorganic body, provokes reaction. When the anvil is struck, the hammer rebounds; when the eyeball is touched, the lids close. When motion is impressed upon the animal organism, motion is released from it. The rebound, or reaction, or reflex, of the animal organism, is more immediate and more simple the shorter the distance to which the impressed motion has penetrated into the interior of the body; and the further it penetrates before it provokes reaction, the more is the reaction delayed, and the more elaborate is it when it does at length take place. A touch upon the eyeball evokes an instant closure of the lids; a threatened blow evokes a dodging of the head

and body, or peradventure a retaliatory assault; the perusal of a threatening letter evokes a visit to a solicitor. It is that emission alone of motion that takes place from the highest nerve regions that is accompanied by the mental state of Attention.

But the animal organism is not a mere reflective mechanism. It is also the seat of a store of motion that from time to time is emitted spontaneously. When motion is impressed upon an inorganic body, the body may absorb a part of the motion and emit the rest, as when an anvil is struck, and absorbs part as heat and internal strain, while part is emitted as rebound and as sound. Or, if the body contain a store of motion, the incidence of additional motion may act as liberator of the motion in store, as when the spark reaches the gunpowder, or the flame acts upon coal. Animal organisms also contain a store of motion, and the impress of motion upon them, if it reaches the store, liberates motion therefrom. But animal organisms have a further property which most inorganic bodies have not. They are continually adding to their stores of motion, and by these continual additions their store at length becomes surcharged. The tension of the contained motion reaches such a pitch that the containing resistance is no longer sufficient to keep it in bond, and it breaks out, possibly without the provocation of added motion, certainly with minimal provocation.

Although, however, there is a clear distinction between the emission of motion from the highest nerve regions as a reaction elicited by incident motion, and the spontaneous emission of motion from store, it is highly improbable that either actually occurs without the other. It is most improbable that there is any reflex action to which some of the stored motion of the organism is not added. It is most improbable that any seeming spontaneous emission of motion takes place, whose occurrence at that particular moment, and in those particular circumstances, is not due in some degree to the impress of the circumstances. Still, in every action, whether actual or potential only, of the organism upon its circumstances, a discrimination may be made. There can be recognised either the action that is evoked in response to stimulus, or the action that is the spontaneous autogenic activity of the organism, or more commonly a combination of the two in some one of the most various proportions. Intimately as they may always be associated in experience, they can yet be discriminated.

To these two modes of emission of motion two modes of consciousness correspond, both of which are included under the head of Atten-

tion. That mode of consciousness which accompanies the reflex emission of motion is termed Reflex or Passive Attention; while that which accompanies the spontaneous emission of motion, or the emission of motion in excess of that which is incident, is termed Voluntary Attention.

Here we meet for the first time with the term *Voluntary*, a term which is often applied, not only to Attention, but to movement, action, conduct, thought. To whatever it is applied, the term carries always the same implication; it implies always a state of consciousness, a movement, act, or series of acts, corresponding with, or actuated by, the spontaneous autogenic activity of the highest nerve regions, or the spontaneous element in the mixed activity of these regions. It is applied, in short, to the effect or the accompaniment of the emission of stored motion, and the more obvious the provocation, solicitation or stimulus of incident motion under which the stored motion is emitted, the less appropriate is the term Voluntary to the effects and accompaniments of this emission; while the less obvious the occasion provided by the incidence of motion for the emission of motion from store, the more completely applicable does the term Voluntary become to the effects and accompaniments of this emitted motion. It is *primâ facie* unscientific to use, with respect to movements, the term Voluntary, which connotes a mental state; and it is not very satisfactory to use, with respect to mental states, the term Reflex, which connotes motion; but the terms have so long been used as complementary and contrasting, that it has now become difficult to dissociate them; and the term Spontaneous, which may be more accurately applied to the emission of motion beyond Reflex emission, is itself not free from objection. From what has already been said it will usually appear plain in what senses the terms are used here.

There are commonly said, as already stated, to be two forms of Attention, Reflex and Voluntary; but this is not correct. The accurate statement is that there are various degrees of Attention. The reaction of the highest nerve regions to incident motion—the reactive emission of motion—is attended by a twofold accompaniment in consciousness. There is, first, an intensification of the Sensation which arises under the incoming motion; and there is, second, an awareness of our own activity in connection with this intensification. It is this latter element in consciousness to which the name of Attention is given.

If the incoming motion evoke no reaction, there is no intensification

of the Sensation, nor is there any Attention to the Sensation. If the incoming motion evokes a reactive emission of motion, then the ratio, which the amount of the liberated motion bears to the amount of the incoming motion, determines the degree of intensification of the Sensation, and determines also the degree of Attention bestowed upon the Sensation. When the amount of incoming motion is great in proportion to the amount evoked and emitted upon its reception, then the intensification of the sensation is slight, the awareness of activity is slight, and then the Attention is termed Reflex Attention. When the amount of motion evoked by stimulus is great in proportion to the stimulus, then the intensification of Sensation is great, and then the awareness of activity is great, and then this awareness is termed Voluntary Attention. It is evident that as there may be all degrees of proportion between stimulus and reaction; and correspondingly all degrees of proportion between Sensation and Attention; so there may be all degrees between Reflex Attention and Voluntary Attention; and that the difference between these two forms of Attention is a difference, not of kind, but of degree.

When I receive a slap on the back, or a gun is fired close to me, the impression on my highest nerve regions, through my sense organs, is of considerable intensity, and the reaction is also considerable. But though the reaction is considerable, it bears but a small proportion to the amount of received motion, and, consequently, the intensification that the Sensation receives is but slight, and the Attention does not exceed the degree that is termed Reflex. Since there is liberation of motion from the highest nerve regions in answer to the stimulus, there is Attention to the sensation; and since the absolute amount of motion liberated is considerable, the degree of attention is considerable; but since the ratio of the amount of this liberated motion to the amount received is not great, the Attention is Reflex and not Voluntary Attention.

It may be said that the statement that the amount of emitted motion bears but a small proportion to the amount of motion impressed is a gratuitous assumption, and is even contrary to fact; for when the gun is fired I give such a start that I am like to jump out of my skin, and the motion thus emitted is far greater than that received through the medium of the ear. The fact is admitted, but the interpretation is not. It is true that, under the circumstances in question, the total amount of motion emitted by the organism is greater than that received; but

the degree of Attention depends, not upon the ratio of the amount of motion emitted by the organism to the amount received by it, but to the ratio of the amount emitted by the highest nerve centres to the amount received by them; and the start that is provoked by the report of the gun is actuated, not by motion emitted from the highest nerve regions, but by motion emitted from regions lower in rank. The proof of this statement is the fact that, if notice is given me that the gun is about to be fired, I can control the start; that is to say the highest nerve regions can inhibit those by which the start is actuated, and which must therefore be lower in rank.

Now observe that the activity of, or emission of motion from, the highest nerve regions, by which this inhibition is brought about, is accompanied by Attention, and by Attention which has in a high degree the character of active or Voluntary Attention; and observe that, correspondingly, it bears a high proportion to the stimulus, the reception of the information, which set it going; a proportion so high that it continues in operation long after that stimulus has been received and has sunk to the neighbourhood of zero, except in so far as its action is prolonged by active memory. Here, then, the law, that the voluntariness of Attention is determined by the ratio of emitted motion to received motion, holds good.

During the time that I have been writing these lines, a series of impressions has reached my highest nerve regions, and a series of sensations has been educed in my mind, by the twittering of the birds in the tree outside my window. The sensations were produced, and were neglected. I was conscious of them; but I was but little conscious of them. The motion proceeding from the birds' throats was received indeed, by my highest nerve regions, but it was small in amount; it was feeble in intensity; and it aroused no reactive emission of motion. I paid no attention to the sounds. Now, however, my consciousness with regard to them is different. The sensations are intensified. I cannot say that they are louder, but they are more prominent in consciousness; I am more aware of them than I was; and at the same time I am aware of a certain activity of mind directed towards these sounds, or connected with this intensification of them, and this awareness of activity is what I allude to when I say that I am paying attention to the sounds. As the magnitude of this state of mind which I call awareness of activity bears a considerable proportion to the magnitude of the sounds, I speak of the attention as Voluntary rather than as

Reflex, although it partakes almost as much of the latter as of the former quality.

Now I "strain my ears" to discover if there may not be the other sounds whose provocation has been reaching me all this time, and has been neglected; and by "close attention" I am able to hear the faint cry of far-off rooks that are attending to their young. Of these I have been hitherto, as far as I am able to judge, wholly unconscious. It is not until a preliminary attitude of attention has been assumed that the sounds become audible. Doubtless the rooks have been uttering their cries all the morning through, but it is not until the sensations have been intensified, by the direction of activity towards them, that they become discernible components of consciousness. Here, then, there is an exertion of attention which actually precedes, or appears to precede, the sensation toward which it is directed. Doubtless it was evoked by previous states of mind; doubtless the emission of motion from the highest nerve regions, which underlies it, was determined by the stimulus of some pre-existing free motion existing in or arriving at them; but with respect to the sounds toward which the attention was directed, the activity was antecedent, was spontaneous, was not reactive but wholly autogenic; and the Attention to these sounds was consequently in the highest degree a Voluntary Attention, the ratio of emitted motion to received motion being as a positive quantity to zero.

When the content of consciousness is not presented, but wholly represented states, the determination of Attention, as Reflex or Voluntary, follows the same rule. So long as the solicitation of wandering currents of motion arouses activity not exceeding their own, so long as the mind is in reverie, and states of consciousness arise passively, so long is the Attention given to these states a Reflex Attention; but as soon as motion is added by any active region in excess of what is received by it, as soon as the awareness of activity becomes a prominent element in consciousness, so soon does the character of the Attention emerge from the Reflex into the Voluntary; and the greater the proportion of added motion, the more prominent the awareness of activity in proportion to the object of thought, the more Voluntary the quality of Attention becomes.

Such being the varieties of Attention, our next task is to discover its determinants. Of the multitude of impressions that are momentarily made upon the senses, what is it that determines which shall be

attended to and which neglected? Of the multitude of associated states that any state of consciousness may arouse into nascent prominence, what is it that determines the selection of some and the rejection of others?

(*a*) Of sensory stimuli, attention will be determined, other things being equal, by the magnitude of the stimulus, magnitude including both volume and intensity. That is to say, of two stimuli of equal volume, attention will be determined to the more intense; if two stimuli of equal intensity, attention will be determined to the more voluminous. When a man is so injudicious as to incur the enmity of a hive of bees, and to be stung by a dozen or a score of them, he will find that, out of this number, the stings of one or two have a greatly superior intensity, and to these stings his attention will be directed, to the neglect of the others. The rumbling of a van in the road hard by will attract his attention rather than the rumbling of a train in the distance.

(*b*) It would seem that, although volume is not easily nor accurately comparable with intensity, yet so far as they are comparable, the intensity of stimuli is a more powerful determinant of attention than is volume. The rumbling of a train a quarter of a mile away does not attract attention in the same degree as does the buzzing of a bluebottle in this room. The added warmth that reaches me, in the removal of the screen that stood between me and the fire, does not attract attention in the same degree as does the falling of a spark upon my hand from the cigarette that I am smoking.

(*c*) In a complex of presentation of which the greater part is familiar, attention will be attracted by unfamiliar elements. We meet a friend who has shaved off his moustache since we last saw him. Attention is at once attracted to, and held by, his mouth. Or we meet a woman who has a mole on her cheek, and attention is attracted to and held by the mole. We come home after spring cleaning, and find that a cabinet has been moved from one side of the room to the other. The unfamiliarity in the familiar complex attracts attention. An unfamiliar symptom to the physician, an unfamiliar operation to the mechanic, an unfamiliar detail of construction or material to the builder, an unfamiliar rig to the mariner, an unfamiliar appliance to the engineer, an unfamiliar plot to the critic of novels or plays, all determine the direction of attention to the unfamiliar element.

(*d*) Conversely, in a complex of presentation of which the greater part is unfamiliar, attention is attracted by what is familiar. Among

a crowd of strangers a familiar face attracts attention; in a friend's library the duplicate of some book that is in our own; among the unfamiliar flora of a foreign country a familiar plant; our own or our friend's name in a list; anything characteristic of our own nation in a foreign country; a plagiarism in a book; ice in summer and snow in harvest, all attract attention.

(*e*) The contrast of familiarity and unfamiliarity is not the only contrast which attracts and secures attention. Any contrast of whatever kind will do the same. A spot of whitewash on a dark wall; a coloured stain on a white ceiling; a man in a tall hat in a crowd of labourers; a wheelbarrow in a dining-room; italics in a page of roman print, or roman in a page of italics; the crying of a child during a sermon; coughing at a concert; a moving object among fixtures; a fixture among moving objects; differences of degree; differences of magnitude, differences of intensity, differences of any kind, all excite attention.

Now, if we turn back to our former headings, we shall find that the determinants of attention therein enumerated can all be resolved into contrasts—into differences—and that the degree in which attention is excited is strictly in proportion to the magnitude and sharpness of the contrast or difference. That it is in proportion to the magnitude of the difference or contrast appears from what has been already said; it has now to be noted that it is proportionate also to the suddenness or sharpness of the contrast. We are waiting in a train for the line to be cleared, and the engine of another train draws up somewhere in the neighbourhood. After five or six minutes or so we become aware—our attention is attracted by the fact—that this neighbouring engine is blowing off steam through its safety valve with an objectionable noise; and at the same time we are aware that before we attended to it it had already been blowing off steam for some time. We cannot, however, remember the moment when it began, but we experience a momentary surprise that so piercing and distracting a noise had not attracted our attention before. What has happened is, that the engine began to blow off steam with a noise that was not of sufficient magnitude, that did not form a sufficient contrast with the other existing noises, to attract attention; and that it increased by continuous and gradual increments, so that at no moment during the process of increase was there any sudden augmentation of the sound. From the absence of any sudden augmentation it followed that attention was not directed

to the noise until it had reached a loudness considerably beyond what would have attracted attention had it started suddenly.

So well recognised is the necessity of suddenness as well as of magnitude in the stimulus for the excitement of attention, that the conduct of men has long been regulated in accordance with it. When a tyrant wishes to encroach upon the liberties of a free people, he does not begin by abrogating laws wholesale, but by allowing an exception here and an exception there to their operation, and proceeding gradually from small things to great. Thus James II. in time of war gave commissions in the army to Roman Catholics, a breach of law which passed unnoticed. When the war was over, he retained them in the army, and still no complaint was made. Had he proceeded cautiously and gradually, he might have officered his army with Catholics without arousing attention, but when he announced that he would no longer be bound by the Test Act, he attracted the attention of the country instantly to his proceedings. When a landowner wishes to purloin ground from a neighbouring common, he does not begin by building a wall round it. He puts up a post or two. Then after a time he adds to them till there is a row of posts. Then he puts a chain from post to post, and so leaves the matter for a few years. Then for the chain are substituted wooden rails, and in time the fence thus erected is succeeded by a wall. The gradual nature of the operation eludes the attention that it would arouse if it were done suddenly. So, when a tradesman makes up the book of a new customer, he does not, like the unjust steward, begin to cheat him of a half or four-fifths, but adds an ounce here and a quarter of a pound there, and waits to see if notice is taken. If these peculations attract no attention, he increases them next month, and so goes on until he reaches the maximum that he thinks is likely to pass without attracting attention; well knowing that if he had begun at this maximum, attention would have been directed to it immediately.

The explanation of this delay in the movement of attention is very obvious, and hangs upon one of the most primitive properties of nerve tissue. When a warm wire is applied to the nerve of a nerve-muscle preparation, activity is at once excited in the nerve, and the muscle contracts. But if the nerve is laid upon the wire and the wire is gradually heated, it can be raised, without the production of any contraction in the muscle, to a much higher temperature than that which, suddenly applied, caused it to contract before. In order to excite the activity of nerve tissue, not only is it necessary that there should be a

change in the amount of incident motion, but this change must occur with some suddenness, with some rapidity approaching to suddenness, for it to have its full effect. Since Attention is the mental accompaniment of the activity of nervous tissue, and of the emission of motion by this tissue, it is clear that it is determined by the determinants of this activity, and of these determinants the application of a stimulus is one. The efficiency of a stimulus in exciting the activity, reaction, or emission of motion from, nerve tissue, depends upon both its magnitude and its suddenness—upon the quantity of motion that is incident and upon the suddenness with which the incident motion impinges, and hence upon these two conditions depends also the occurrence of reactive or Reflex Attention.

But the activity of the central nerve tissue does not depend solely upon the stimulus which reaches it, still less does it depend solely upon the motion which is impressed upon the peripheral nerve endings; these therefore are not the sole determinants of attention. When motion is incident upon the surface of the organism, it finds its way to the highest nerve regions along lines of least resistance, that is to say, along customary paths, and the particular district of the highest nerve regions that is reached and stimulated into reactive activity by the incident motion, will thus be determined by the constitution of these, and of subsidiary regions, as settled by previous experiences. So that, other things being equal, when a complex of impressions is incident upon the highest nerve regions, those will arouse more reactive activity which are more familiar, or which reach regions in which activity is more habitual; while those will arouse less activity which penetrate to regions in which activity is less habitual. The paths to the former being lines of less resistance, motion will traverse them more readily and in greater quantity; the paths to the latter being lines of more resistance, motion will traverse them with greater difficulty and in less quantity. When, therefore, a complex of presentative-representative states arises in the mind, attention will be directed, other things being equal, to those that are more familiar or belong to a more familiar class, while those which are less familar or belong to less familiar classes will be neglected. Thus it is that, when different persons witness the same scene, they pay attention to different features in that scene according to their previous experiences. Of several persons who witness an accident in the street, for instance, one, a policeman, will pay attention to the fact that the van is on its wrong side of the street; another, a coach-

man, will notice that the horse has got its leg over the trace; another, a surgeon, will notice that the victim has a broken leg; a fourth, a pickpocket, will notice that the gathering of a crowd gives him an opportunity of plying his occupation; and so forth. So, if a dead bird be brought under the notice of different individuals, each will observe in it those features with which he is accustomed to deal. The sportsman pays attention to the way in which it was shot; the poulterer notices its age and condition; the furrier attends to the state of its plumage; the biologist to the adaptation of its structure and colour to the conditions of its life; the fly-fisher to the brilliancy of its hackles; and so forth.

Lastly, the emission of motion from nerve tissue, and therefore the attention, which is the mental accompaniment of that emission, depends largely upon the condition as to repletion or depletion with motion of the tissue concerned. When replete, motion will readily issue upon slight stimulus; when deplete, motion will issue with difficulty and only upon strong stimulus; and consonantly, the direction of attention will be determined, other things being equal, by the relative proneness to activity of different regions of nerve tissue among the highest. The influence of this repletion of motion in determining attention is manifested in several ways. In the first place, it accounts for the increasing difficulty of fixing or retaining attention that comes on with fatigue. The longer and the more vigorously a region of nerve tissue has been emitting motion, the less spontaneously will it emit what remains in store; the less is the amount of motion that it will issue on a given stimulus, the stronger the stimulus needed to evoke a given reaction. Hence, the longer the activity of the highest nerve regions has been maintained, the less of spontaneous or Voluntary Attention is available, and the more is the need of stimulus if attention is to be maintained. Those tasks which demand the exertion of Spontaneous Attention are therefore undertaken by choice in the morning, when the store of motion in the highest nerve regions has recently been replenished during sleep; while the things to which attention is given in the evening, when the store of motion is comparatively deplete, are those in which the attention is Reflex. The morning is the time for business, for overcoming difficulties, for solving problems, for original thought, for new acquisitions, for attending to matters that are not intrinsically attractive; the evening is the time for recreative activity; for less spontaneous exertion of attention; for more allowing

the attention to be solicited; for witnessing spectacles; for hearing music; for reading books, not of study, but of recreation.

What is true generally of all the highest nerve regions is true specially of each. Attention is determined, not only by absolute, but by relative repletion. After a given region has long been active, after attention has long been occupied about a particular subject, activity tends to subside in that region, and to arise in others that are less deplete; and correspondingly attention tends to wander; to leave the subject upon which it was occupied and to turn to others that obtrude themselves.

From the same principle, that Attention is the mental accompaniment of emission of motion from the highest nerve regions, and has for one of its determinants the amount of motion, absolute and relative, stored therein, it follows that, as the activity of a capacious, well-developed region will be more copious and will be maintained longer than that of a confined and ill-developed region, so the corresponding attention bestowed upon the one activity will be highly spontaneous and long maintained, while the attention bestowed upon the other will be less readily elicited and of shorter duration; and as different individuals are very variously endowed with respect to the relative capacity and degree of development of their several nerve regions, it will follow, first, that, in the same individual, attention is spontaneously directed to some subjects rather than others—that some subjects are favourites and others antagonists of attention;—and second, that these favourites and antagonists of attention are different in different people, as all experience testifies. Furthermore, it will follow that the more replete with motion the highest nerve regions are maintained, the more readily will attention be forthcoming; and the more capacious these regions for the storage of motion, the longer can attention be maintained. In other words, the more energetic the individual, both in respect of the ease with which his stored motion is expended, and with respect to the amount in store, the more attention will he have at command, both to turn and to maintain upon a given object.

The determinants of attention may therefore be divided into external and internal. The external determinants of attention are the amount of the stimulus that elicits the attention, and the suddenness with which this stimulus is applied. The internal determinants of attention are, first the constitution of the nervous system as to the directions in which it is relatively permeable to incoming currents, and therefore

as to the regions that are more readily aroused to activity by them; and second, the absolute and relative repletion or depletion of its parts with motion.

The effect of attention upon the mental content is twofold. It brings about a concentration of the field of consciousness; it diminishes the area over which consciousness is spread; and at the same time it intensifies the vividness and clearness of consciousness in the limited area that remains. The matters attended to stand out in more prominent relief, their details become more clearly defined; and at the same time, conscious states in the area outside the field of attention become dim, and lose their definition. Attention is a process of concentration and unification. The more active it is, the more is the content of consciousness limited and unified. If we appear to attend to more than one thing at once, it is easily ascertained by introspective observation that what appears to be a simultaneous attention to more things than one, is in reality a rapid oscillation of the attention between them.

EFFORT

Associated with many of our experiences of attention is a mode of consciousness which we call Effort, a mode of consciousness connected closely with the activity of the organism, including a more vivid and intense awareness of activity than mere attention, and distinguished not only by its superior intensity, but by some other quality, from attention. We speak sometimes, and we speak correctly, of an "effort of attention," and, although our nomenclature of states of mind is not sufficiently developed to allow us to describe in what the difference consists, yet it will be admitted on all hands that between Effort and Attention there is a difference additional to and beyond a difference of degree. It is true that Effort is never experienced apart from Attention, but still it is something different from Attention.

That form of attention that we term passive or reflex is never attended by Effort. Effort attends that form of attention only that we distinguish as Voluntary or Spontaneous; and this form of attention may or may not be accompanied by Effort.

The same, or nearly the same, external manifestation of activity may be accompanied by effort at one time and not at another time. I say

nearly the same, for when the mental state of Effort comes into being, the movement which it attends usually alters somewhat in character. The effective movement becomes associated with various non-effective movements, sometimes slight, sometimes pronounced, which carry to the observer the knowledge that they are accompanied by effort. Movements not so accompanied,—effortless movements,—we are wont to call graceful, easy, springy, or by some allied designation; while to movements accompanied by Effort we give the title of laborious, strenuous, and so forth; and we are apt to think of effortless movements as rapid, and of effortful movements as slow.

The well-trained athlete, who starts to run a race, traverses the first part of his course without effort. After a time, effort begins to be experienced; and towards the end, when he is straining all his power to overtake his most formidable competitor, it becomes a very prominent element in consciousness. Conversely, when a new set of muscular adjustments is being acquired; when we are learning the pronunciation of a new language, the performance of a new piece of music, a new step in dancing, a new stitch, or any new handicraft, there is a vivid consciousness of effort, which diminishes as the nervous mechanism is perfected, and finally disappears altogether when this becomes complete. As effort rises into prominence in the runner towards the end of his course, certain movements, absent before, become added to the whole complex of movements that he executes. His face assumes an eager expression, his eyes stare, and at length his shoulders work, his hips roll, and the addition of these and other movements gives to his whole gait a clumsy, laboured, lumbering appearance, very different from the easy, springy step with which he started. So too in the first stages of acquiring a new movement, when Effort is a prominent feature in the mental complex, extraneous and unnecessary movements accompany those that are being acquired. The young penman twists his tongue about; the novice in skating throws about his arms as well as his legs, and grimaces into the bargain; the tyro in music scowls at his score, the young sempstress purses her lips as she sews her seam. But as facility in movement is attained, all these extraneous movements subside, and with their subsidence Effort disappears. What is the significance of these observations with respect to the nervous process with which Effort corresponds?

If we seek for the most characteristic and well-marked instances of the consciousness of effort, we shall undoubtedly find them in those

cases in which great bodily exertion is put forth to overcome great external resistance, as for instance in a tug-of-war, or when we are trying with all our force to push open a door, which someone on the other side is endeavouring to keep closed. If our antagonist gives way, if the resistance to our efforts diminishes, the consciousness of Effort diminishes *pari passu*; and when his resistance ceases, effort ceases simultaneously. If on the other hand he bears us down, and we relax our fruitless exertion, then, as our exertion relaxes, so does Effort diminish, and when exertion disappears, Effort disappears with it. In these cases the magnitude of the consciousness of Effort is proportioned to the resistance which is opposed to our own exertion. If I find a door partly open, and in order to push it open far enough to give me ingress, I apply a light pressure with the tips of my fingers, the magnitude of the Effort of which I am conscious depends entirely on the weight of the door, *i.e.* upon the amount of resistance that it opposes to the activity that I exert. With a light door, the Effort is small; with a heavy door, the Effort is greater. Suppose however that the chain is on the door, so that when I lightly press upon it, it does not stir. Still, whether the door moves or no, the Effort is unaltered so long as the amount of exertion or activity that I put forth is unaltered. Yet Effort does not depend directly upon the amount of exertion put forth or activity exercised, for if this exertion or activity meet with no resistance, or with minimal resistance, no Effort is experienced. Effort increases, it is true, with activity, when the activity is opposed; but only because when the object against which our activity is directed is immobile, resistance increases *pari passu* with activity. Action and reaction are equal. To a light pressure the chained door responds by a slight resistance, to a powerful pressure it responds with a powerful resistance, and it is the amount of resistance encountered, not the amount of exertion put forth, that determines the magnitude of Effort.

It may be objected that in the case of the runner, the resistance—the weight of his body—is the same from beginning to end of his race, and that in his case the dependence of Effort upon resistance does not hold good; but it does still hold good, only the resistance that his exertions encounter is no longer an external but an internal resistance. He starts with all his nerve centres fully charged with energy, and with all his muscles in the highest degree adapted for action. The motion that the centres contain is motion under tension, motion that is struggling to escape. The muscles are in such condition that they are ready to

respond by contraction to minimal stimuli. The internal resistances being minimal, the consciousness of Effort is minimal. As energy is expended in keeping up the pace, not only do the muscles need stronger stimuli to whip them into activity, but the lower centres become depleted of their energy and need to be reinforced from the stores of the highest nerve regions; and this issue of motion to the locomotor mechanism involves, of course, the direction of attention to the movements of the legs. The need of the lower nerve centres, which has been called a need of reinforcement, is a need of increase of tension to overcome resistance. If the replete nerve centre does not expend its motion instantly and explosively, it is because the motion is confined and restrained within it; it is because to its emission there is opposed a resistance; and if the contained motion finds greater and greater difficulty in issuing from the centre, it is because the resistance to its egress is increased, either absolutely or relatively. I believe that it increases absolutely, but it is obvious that if it remains absolutely constant, it must, as tension diminishes, increase relatively; and with the rise of this internal resistance to the activity of the highest nerve regions, Effort begins to be experienced. As the energy of the nerve centres becomes more and more depleted, as the resistance to the emission of motion from them increases, as the resistance to the activity of the highest nerve regions rises; so the consciousness of Effort becomes more and more conspicuous.

Collateral proof that the consciousness of Effort depends upon resistance to activity is given by the appearance, simultaneously with the augmentation of Effort, of the associated movements to which allusion has been made. The appearance of these associated movements, of the working of the arms, the bowing of the head, the set face, the tightly clenched hands, the rolling hips, towards the end of the race, shows that motion is being diverted into collateral channels in the nerve regions concerned in the movement; and such diversion of motion, at a time when the aggregate of available motion is diminished, is explicable only on the hypothesis that the resistance to its passage through the direct channels is increased. It is true that these collateral movements do not always appear, or are not always conspicuous, but in these cases the athlete voluntarily suppresses them, and their suppression equally indicates a diversion of motion from direct channels.

The same diversion of motion from direct channels is more conspicuously displayed in connection with the consciousness of Effort in

those cases in which a new set of movements is being acquired. In such cases the motion issued from the highest nerve regions is directed into new and unaccustomed channels, is in fact employed in forcing new channels through hitherto untraversed nerve tissue, and obviously encounters more resistance in so doing than in traversing accustomed paths. In order to force these new channels, much motion is issued, and since resistance is high, some of the motion overflows into accustomed paths and gives rise to the associated movements. As the practice is continued, the new channels become more and more completely formed, better and better proportioned to the amount of motion that is sent through them; resistance to the flow of the motion diminishes; the associated movements cease, and with them the consciousness of Effort subsides. Thus all our experiences concur in attributing the nervous condition of Effort to the amount of resistance which the issue of motion from the highest nerve regions encounters.

The emission of motion from the highest nerve regions may be of insufficient magnitude to reach the muscles, or at any rate to reach them in the quantity necessary to excite sensible action. Yet we have daily experience that such small discharges may be accompanied by Effort, as for instance when we are working out a difficult problem or trying to recall a forgotten name. It is obvious that such cases are explicable upon the principle already employed, and that the physiological substratum here claimed for the feeling of effort may be present equally whether the nerve current does or does not reach the periphery. In passing through nerve tissue in amounts disproportionate to the calibre of the channels that it traverses, the outgoing current of motion must encounter resistance; and when resistance is encountered by the issuing motion, Effort is experienced.

WILL AND DESIRE

The psychology of the will is the most obscure branch of the whole science of Psychology; and at the same time it is so manifestly and greatly important that it has in all ages attracted the most profound and acute, as well as many more superficial thinkers; so that there exists with regard to it a vast body of opinion, directed especially to that aspect of the matter which relates to the alternative of Free-will or Determinism. The secular antagonism between the respective advocates of the two views thus denominated goes back to the dawn of

history. Not to mention innumerable latter-day writers, we find that from Huxley and Martineau to Hobbes and Locke, from Hobbes and Locke to Luther and Calvin; from Luther and Calvin to Aquinas and Erigena; from Aquinas and Erigena to Augustine and Pelagius; from Augustine and Pelagius to the Sadducees and Pharisees, the controversy can be traced in uninterrupted succession. Nor is it confined to this line of descent only. The same question divided the Shiites from the Sunnites; and although those of the Greek dramatists whose works have come down to us all espoused the same side, we may be sure that, among a people of such high intellectuality, so disputable a subject was not similarly regarded by all, but that Free-will had then, as at all other times, its advocates.

As with other terms used in Psychology, the terms Will, Voluntary, and Volition, and their equivalents, have not always been used in the same sense; and there are in particular two different meanings attached to these words, which, though their difference is very obvious, are seldom formally distinguished. They are always used in connection with the activity, and with the spontaneous activity, of the organism; but sometimes they are used to express the *choice* of a mode of activity, and at others to express *persistence* in a mode of activity, and although the latter meaning is sometimes distinguished by the use of the expression, "Strength of Will," or some equivalent, it is often not so distinguished. It is important, however, that the distinction should be made. Of course, the term activity is here understood to include as well the suppression as the initiation of movement.

Activity of the organism is divisible into Reflex activity and Spontaneous activity. The former is the result of the action of a completely organised nervous mechanism, action which is elicited by the impress of familiar circumstances; which immediately and inevitably follows the impress; and which is strictly determinate in character. When the body is falling forwards, the arms are projected; when the body is suddenly immersed in cold water, we gasp for breath; when the eye is suddenly approached, the lids close. In each case the action follows immediately upon the impress of the circumstances; in each case it is inevitable,—it never fails to occur when the impress is made; and in each case it is determinate,—given the circumstances, we can predict with certainty what the action will be. It is the result of an impress upon a completely organised mechanism, and does not admit of modification. It is a direct reaction to stimulus. Such determinate

acts, following inevitably upon specific stimuli, are called, from their most conspicuous feature, Reflex Acts. In so far as an act partakes of the characters of Reflex Acts, in so far is it removed from the category of Voluntary Acts; in so far is it destitute of that particular mode of consciousness that we term Will; in so far is it Involuntary.

Spontaneous acts differ from Reflex acts in that their occurrence is not necessarily determined by a specific stimulus; and, even when elicited by the impress of circumstances, it is not an instant and immediate response to stimulus, but is more or less deliberate and delayed. It may be a reaction to stimulus, but it is not a direct reaction; and it may be in large part, or altogether, not a reaction, but a mere action. That is to say, it is not necessarily elicited by the direct impress of motion on the organism, but may be the outcome of the gradual accumulation of motion in the organism, which, in course of time, reaches a degree of repletion at which the motion can be no longer retained. When this point is reached, any minimal increase of motion will overcome the resistance to its discharge, and it will issue in activity which has in a high degree the character of Spontaneity, or of being originated within the organism, and in low degree the character of reaction to stimulus. Activities that are the outcome of this accumulation of motion that finds egress with a minimum of incoming stimulus, are termed Spontaneous, and are also termed Voluntary; for they are accompanied by that mode of consciousness—that activity of the Subject and awareness of our own activity—that we call Volition, or Will; and the degree or magnitude of this mode of consciousness is the greater, the more spontaneous the act, the less directly it is a reaction to stimulus. In dealing with Attention we found that there was every grade and degree between Reflex Attention and Voluntary Attention; and it is obvious that between Reflex and Spontaneous activities, determined as they are by similar factors in the neural process, there will be a similar gradation.

Spontaneous activities as here defined, are divisible into two classes, whose boundaries are similarly indefinite, while the extreme forms are equally well characterised and distinct. They are divisible into determinate and indeterminate activities, according as the spontaneous or quasi-spontaneous emission of motion is from a completely, well, or partially organised mechanism, or from a portion of nerve tissue that is still wholly or almost wholly unmechanised, plastic, and modifiable. In either case, the repletion of the nerve tissue with motion has its

conscious correlative in the state of Desire; which is definitely directed towards a specific end, according to the degree in which the tissue is mechanised; and seeks this end through definite means, according to the degree of organisation of subsidiary mechanisms. When the primary mechanism becomes replete with motion and is accompanied by Desire, the motion is apt to overflow into the subsidiary mechanisms, and this process of overflow, as will presently be explained, has its correlative in the mental process of Willing. The repletion, thus effected, of the subsidiary mechanism gives rise in turn to Desire for the activity of this mechanism, which at length issues in Willing, and so the process may go on by successive steps.

The nature of a nervous mechanism has already been explained, and as described is not difficult to appreciate. It is an arrangement of nerve tissue such, that when motion is impressed upon it in a specific way, or from a specific direction, it reacts by liberating motion in another specific direction. So, when a specific amount of motion is impressed in a specific direction upon the trigger of a gun, motion is liberated from the gun in another specific direction. As in the gun, so in the nervous mechanism, the amount of motion liberated is greater than that received. Both contain a store of motion, and, from the store of each, motion is liberated. This, then, is one kind of nervous mechanism. Let us now consider a somewhat different kind. There are many machines used in the arts which depend for their actuation upon the gradual filling of a vessel with water. The vessel is of such a shape, and so supported, that, as it fills, the centre of gravity shifts, until at a certain degree of fulness the vertical through the centre of gravity falls without the base. The vessel then capsizes; empties its contents; regains its previous distribution of weights; rights itself; and begins to fill once more. The analogy of these machines may help us to understand a second class of nervous mechanisms, graduating, indeed, into the first class, but, in their pronounced forms, differing from the first in that the store of motion, which they are adapted to contain, continues to accumulate until it reaches a degree of tension under which the mechanism can no longer contain it; and, when thus surcharged, the mechanism spontaneously liberates its motion in certain specific directions and combinations, from which specific acts of the organism result.

We speak of these arrangements of nerve tissue as mechanisms, and the word is the best that we have at our service; but while we are com-

pelled by observed phenomena to believe that the specific activities, which we see repeated in the same specific forms by many different individuals, do depend upon a specific arrangement of nerve tissue, an arrangement which it is possible that future refinements in our methods of research may in the distant future enable us to identify; we must admit that, in the present state of our knowledge, the mode of arrangement which we connote by the term mechanism is in this case but dimly and imperfectly conceivable by us. When we find, for instance, that, at a certain time of year, hundreds of thousands of birds exhibit simultaneously the same restless activity; that they gather into huge flocks; that at length they start upon and pursue a journey of thousands of miles, with the most eager impetuosity; that they arrive with undeviating accuracy at the same country; that on arriving, the flocks disperse, over a vast area; and that then every individual sets to work to make a nest, which agrees exactly in the main features of position with regard to surrounding objects, of material, of size, of shape and of mode of construction, with the nest of every one of the other hundreds of thousands of birds of the same species; when we remember that these acts are performed, not only by the old and experienced birds, but also by the young and inexperienced; when we view all these facts, we cannot, so long as we admit the dependence of animal activity upon nervous function, refuse to admit that such similar specific acts executed by such multitudes of unconnected, non-conspiring, untaught individuals, must be due to the activity of similarly constituted specific tracts of nerve tissue. In what way, by what means, a tract of nerve tissue can "represent" such an elaborate sequence of acts; how it can be so constituted that motion shall issue from it in such an orderly succession of complex combinations, spread over such a length of time, we cannot as yet form any definite concept. Neither can the savage or the ourang form any definite concept as to the arrangement of the mechanism by which a steamer voyages from port to port, or a power loom produces a piece of damask, or a clock marks the hours by its chimes; and yet the developed ourang, the improved savage, can not merely conceive and understand, but can invent these mechanisms; and similarly we may be sure that more developed man will be as able to form as clear a concept of the way in which the migratory and nidificatory activities of the bird are embodied in the structure of its nervous system, as latter-day man can form of the way in which the chiming activity of the clock is embodied in the

structure of its train. The difficulty of clearly representing the details of the mechanism, need not therefore hinder our acknowledgement that the specific and determinate conduct that we witness is due to the activity of specific and determinate arrangements of nerve tissues.

While the clock is unwound, it is still a time-recording mechanism *in posse*, though it is not so *in esse;* and while the instinct-mechanism is a mere structural arrangement, inert, inactive, empty of motion, so long does the organism contain an instinct *in posse* which is not an instinct *in esse*. When the clock is wound, then its time-recording function becomes imminent, and needs but a touch, a shake, to make it actual; nay, there are clocks so delicately made and poised that no touch, no shake, is needed; but the mere addition of sufficient motion by the winding of the spring suffices to start them into the mode of activity which their structure determines. And so it is with the determinate structures that actuate instinctive conduct. As motion is stored within them, their tendency increases to manifest the specific mode of activity which this structure represents. When the stored motion increases so that the mechanism is replete—when the spring is fully wound,—then a minimal stimulus, or even no stimulus at all, is needed to start the mechanism into activity; then the instinctive conduct will be entered upon and pursued, in the absence of limiting conditions, until the contained motion is exhausted, until the spring is run down.

While the mechanism is empty, or while it is deplete of motion, its mere existence will no more be accompanied by a state of consciousness than is the mere existence of an inactive structural memory; but in proportion as the spring is wound; in proportion as the mechanism fills up with motion; in proportion as the contained motion presses against the barriers, whatever their nature, which hinder its escape; in proportion as the instinctive act approaches the verge of actual performance; in that proportion arises in consciousness the state that we call Desire, a state that, as it accompanies incipient spontaneous activity, so is it incipient Will. As the mechanism becomes more and more charged until it is at last surcharged, so does Desire increase in intensity, so does it approach more and more in character to Will; and when the surcharged mechanism breaks out into activity; when the instinctive act is performed; when the clock starts going; then Desire merges into and is lost in Will. It merges into Will, which, since it is not chiefly, and may not be at all, elicited by circumstances, but is the accompaniment of spontaneous, as distinguished from reactive activity,

may be called Spontaneous Will in distinction from Reflex Will. It merges into Will, which does not necessarily involve a choice among alternatives, and, in as far as it involves no such choice, is Will or Determination as here distinguished from Willing or Choice.

It is probable that there is more than one way in which Instincts come into existence, more than one influence which determines the construction of such a mechanism as has been described; but, undoubtedly, the usual, the classical, origin of instincts is by the process of natural selection. That is to say, of the random variation of modes of action that are already fixed in structure, those which are more beneficial to the individual and the race secure the survival of their possessors, and are transmitted; while those which are less beneficial secure the earlier destruction and fewer posterity of their possessors. Thus, from the simplest reactions to impressed motion are built up, in the course of innumerable generations, and by an inconceivably wasteful process, the elaborate forms of instinct which have always excited the wonder of mankind. The whole process has been the preservation of that which is beneficial and the destruction of that which is harmful; and the determination of what is beneficial and what is harmful is made, under this process, by the brutal test of experience. The modification of structure first occurs at random, under influences which take no account of benefit and harm to the individual or the race; and not until after the change is made is it submitted to the test, a test which is, indeed, simple and effective, but which involves a frightful consumption, both of material and of time. When we contemplate such elaborate instincts as the migration and nidification of birds, the employment of slaves and domestic animals by ants, and many others, and consider the incalculable lapse of time and the incalculable expenditure of life that must have been incurred in their establishment, the imagination stands aghast, and we are irresistibly driven to wonder if a less tedious and less wasteful mode of securing the adaptation of conduct to circumstances could not be devised. Nor is the inquiry unjustifiable or fruitless. A better mode does indeed exist, and is the subject of this volume. By means of the operation of consciousness, a single individual is able to effect in a moment an adaptation to circumstances which could be effected by natural selection only through the lapse, and in the experience, of countless generations. That selection of beneficial, and rejection of harmful, modes of action, which natural selection can effect only after the mode

of action has been carried out, can be effected mentally by the aid of symbols, whose use abbreviates the process far more than does the use of other symbols by the mathematician abbreviate the process of counting. The mental symbol appropriate to a beneficial course of conduct is pleasure; the mental symbol appropriate to a harmful course of conduct is pain; and by the selection of the pleasurable and the rejection of the painful we are able to forestall the operation of natural selection, and to bring our actions into harmony with the exigencies of circumstances without the need of waiting for the chances of extinction or survival. By aid of these symbols our course is determined without the necessity of going through the secular process of random essay, with its nine hundred and ninety-nine failures to each success. How consciousness came into existence we do not know, but granted the existence of its faintest glimmer, of its most inchoate rudiment, we can see that if that rudiment contained the slightest shade of difference between pleasure and pain, all the rest follows as of course under the influence of known conditions. Natural selection will instantly seize upon this new factor in life, and will foster it until in the course of ages it is developed into the mind of a Newton and of a Shakespeare.

The addition of consciousness to a race of organisms striving after a more complete adaptation to a wider range of circumstances, may be compared to the addition of sight to an individual who is striving to direct his course towards a distant goal. Of ten thousand blind men turned loose at Stonehenge, how few, and after how prolonged a pilgrimage, would reach Salisbury? Of all the myriad forms of rudimentary life, how few, and after what period of time, would reach the grade of a crocodile or a domestic fowl? Mr. Venn has ingeniously speculated that if an idiot—he might have said a mere machine—were to put together at utter random the words of the English language, he would, if he were allowed all eternity for his task, eventually light upon the same order that they follow in Shakespeare's plays. Now if we were to imagine a being standing at the idiot's elbow, who should jog it whenever the idiot chanced upon the right first word, and that thereupon the idiot filed that word, and proceeded at random to add words to the second place until he again chanced upon the right one, when his elbow would be jogged again, and the second word filed in its order, and so on until his play was complete; such an elbow-jogging being would perform, towards the composition of the play, the same function that natural selection performs towards the development of organisms.

A race of organisms is varying at random in all directions. Natural selection jogs its elbow and makes it file each variation that happens to be the right one, destroying the remainder; and in this way an instinctive course of conduct is developed. But with the aid of sufficient intelligence the play can be written straight off the reel, without this tedious process of selection and destruction of random collocations of words; and with the aid of consciousness, a course of conduct can be determined on, a nervous mechanism can be formed, straight off the reel, without waiting for the accumulation of selected increments from random proposals. While natural selection, by circuitous means, preserves the beneficial and rejects the harmful modifications of structure, after the performance of the acts which those modifications of structure represent; conscious selection preserves the beneficial (*i.e.* pleasurable) and rejects the harmful (*i.e.* painful) modification before the performance of the acts, and leaves for performance the beneficial only. Under the selection of Willing none but beneficial acts are performed. How the selection is made will be considered in the next section. What we have now to note is that under the guidance of consciousness nervous mechanisms are formed.

When it is said that under the selection of Willing none but beneficial acts are performed, the statement is strictly correct, but, of course, it is not the whole truth. None but pleasurable acts are chosen, and therefore none but acts that are beneficial in some degree. Since the adaptation of pleasure and pain to the benefit and harm of acts is not complete, it often happens that an act that is pleasurable, and therefore beneficial, in some respect, is harmful, and therefore painful, in some other respect. The imperfect equilibration of pleasure and pain to benefit and harm respectively, will be considered in another place; all that concerns us now is that, under the *vis a tergo* of desire, an end is sought by means decided on according to the guidance of pleasure and pain, and that this determination on a course of action is, in its physiological or neurological aspect the formation of a nervous mechanism. When an organism is endowed with a nervous system whose operations are attended with consciousness, then a given combination of the circumstances which environ that organism can be represented in consciousness before it is present in experience; and in connection with the representation of the circumstances arise the representations of various ways of dealing with them. In the manner that will be considered in the next section, one of these ways of dealing

with the circumstances is selected, chosen, determined on, or Willed; and that which is, in consciousness, the choice, selection, determination, or Willing of a mode of action, is, in nerve tissue change, the formation of a mechanism. That is to say, it is a rearrangement of nerve tissue, such that the mode of action chosen is embodied in the new structure, in the same way, though not to the same indelible degree, that an instinctive mode of action is embodied in the instinct-mechanism. There are differences, it is true. The mechanism of a determination has not the same degree of fixity and unalterableness as is possessed by the instinct-mechanism. Its quantum of contained motion is not obtained in the same way. The connection of its action with the occurrence of specific circumstances is usually closer. But in the respect that it embodies in nervous structure a predetermined mode of action, it precisely resembles the instinct-mechanism, and in either case it is a structural memory.

There are therefore two distinct classes of Determined acts,—those that are determined by Instinct, and those that are determined by Reason; but by whichever process the acting mechanism may have been formed, whether it has slowly developed under the influence of natural selection, or whether it has been constructed expeditiously by an exercise of Willing, its mode of action is the same, and the mode of consciousness that accompanies its action is the same. In either case its action is accompanied by that mode of Volition that is called Determination, a mode that is manifestly different from Willing or Choice.

The two classes of mechanism, different as they are in origin, and disparate as they are in their extreme forms, yet exhibit in various ways, and especially in the gradation of forms, their community of nature. The characters other than their mode of origin, in which they differ, have already been enumerated, but upon examination it is found that none of these is an absolute difference, and even in mode of origin the difference is not always maintained.

In the first place it was said that the reasoned determination has not the same degree of fixity and unalterableness as is possessed by the instinctive determination, and the distinction is valid as far as it goes, but it is not an absolute distinction. Instinctive action, while it is in large degree fixed and unmodifiable, yet is not absolutely unmodifiable. It is to some extent plastic, as will be more fully demonstrated when we come to deal with forms of conduct. It is always

modifiable in its details, and when instinct comes into conflict with reasoned determination, it is not always the latter that gives way. In the second place, the quantum of contained motion is not obtained in the same way in the two cases. The instinctive mechanism contains, in its active condition, a store of pent-up motion with which it becomes charged in the normal process of anabolism: motion which is inherent in, and proper to, its own structure. The reasoned mechanism, or to use a less objectionable phrase, the newly formed mechanism, contains no such store. It is a mere inactive structure unless and until it is plenished with motion from the same source as the motion by which it was formed, that is to say, from the central reservoir in which the available free motion of the organism is stored—the supreme stratum, the highest tract of nerve tissue. A determination recently formed is not adhered to, the activity of the recently formed mechanism is not maintained, without a more positive and active exertion of Will, without something more nearly approaching to Willing, than is needed for the actuation of the instinctive mechanism. The latter, on the other hand, has a more individual spontaneity. It goes more of itself, and with less participation of the active Willing Subject, that is to say, with less reinforcement from this supremest region. It is more a detached and quasi-parasitic activity; acting, indeed, within us, and with our concurrence, but with some degree of detachment from our very self. This degree of independence of action of the mechanism, which is complete in Reflex action and is well marked in Instinct, does not exist, or exists but very slightly, in the recently formed mechanism. But the more frequently the mechanism is called into play, and the more completely, agreeably to the mode of formation of structural memories in general, that it becomes organised, the more capable does it become of retaining a store of motion for its own use; the greater the degree of independence of action that it acquires. Thus we find that even as a man, driven by a craving which arises in him spontaneously, seeks the companionship of the opposite sex; so, driven by a craving of similar spontaneous origin, he winds up his watch. If he is unable to obtain the companionship that he needs, he feels the pain of baffled desire; and if he has left his watch to be repaired, he experiences, when the time comes round for winding it, a momentary unpleasantness of precisely the same character. In this respect also there is, therefore, no absolute difference between instinct-mechanisms and newly formed mechanisms. Lastly, in respect of the closeness of connection with

circumstances the distinction is not absolute. It is a property generally inherent in instinct-mechanisms to become spontaneously active when they become replete with motion, whatever the circumstances of the organism at that time may happen to be; and it is a property generally characteristic of individually formed mechanisms, that, as they are formed under the impress or under the representation of special circumstances, so they do not become active except in the presence of those circumstances. Thus at that time of life when growth approaches completion, and the reproductive apparatus becomes fit to exert its function, the reproductive craving will be experienced, and the society of the opposite sex will be sought; and if he is in a position in which that society is absent, the absence of the propitious circumstances will not prevent the outbreak of the activity. It will affect the form and mode of its manifestation doubtless, but it will not prevent it. The amorous lad, if he have no girl to fall in love with, will seek till he finds one; and, in the meantime, will write poetry, and build castles in Spain, and in other ways express his ebullient activity. But all instinct-mechanisms are not thus independent of circumstances for the appearance of their activity. The instinct of self-preservation, for instance, does not manifest itself except in circumstances that menace the safety of the organism, nor does the instinct of modesty exhibit itself except in the presence of other people. On the other hand, while mechanisms of the other class have invariably been formed under the influence of special circumstances, and for the purpose of dealing with those circumstances, their activity is not always restricted to the occasions on which those circumstances are present, but will sometimes be carried into effect in their absence. For instance, the activities employed in undressing and going to bed have been so frequently repeated that they have become embodied in a mechanism, and this mechanism will frequently act in morbid states, and sometimes in normal states, in circumstances and to an extent that are inappropriate. It has happened to the writer, for instance, to begin undressing for the purpose of dressing again for dinner, and to complete the process and get into bed before realising the inappropriateness of the act, and others have doubtless had the same experience.

For the present purpose, therefore, that is to say, for the characterisation of the states of mind that accompany the activity of a mechanism, it matters not whether the mechanism is an instinct-mechanism, formed in the course of innumerable generations under the operation

of natural selection, or whether it is a mechanism formed in the lifetime of a single individual under the guidance of reason, and by the operation of Volition, or rather, of the physiological counterpart of Volition. In either case the gradual plenishing, up to the point of repletion, of the mechanism with motion, is accompanied by Desire: in either case the activity of the mechanism is accompanied by that mode of Volition that we call Determination; in either case the inability of the activity of the mechanism to find appropriate outlet is accompanied by a painful state of baffledness to which no name has been given.

Few facts in introspective psychology will be more readily admitted than that different Determinations, whether instinctive or reasoned, have different strengths, a fact which is frequently brought home to us by that conflict of Determinations which will be dealt with in the next section; and few problems are more important than the discovery of the factors upon which the strength of Determination depends; for it is manifest that choice is mainly regulated by the relative strength of Determinations. Now it is pretty obvious that the strength of a determination depends, first, upon the degree in which the mechanism, to whose activity it corresponds, is organised, and second, upon the degree of repletion with motion of the organised mechanism. The degree in which the mechanism is organised, the completeness of its structure, will determine the accuracy, sameness, and inevitableness of the acts that it embodies; while the degree of repletion of motion determines the tendency of these acts to attain to performance. Although we thus consider these two characters of the mechanism separately, it is not always easy to separate them in our experience of the action of the mechanism. With regard to instinct-mechanisms, the degree of organisation to which they have attained is the efficiency with which natural selection has done its work; and this depends upon the time during which it has been in operation, and the vigour and frequency with which the mechanism has been exercised. The oldest instincts, and those which have been most important in securing the survival of the race, are, therefore, *cæteris paribus*, the strongest. Hence we see why the primordial instinct of Reproduction is so much stronger than the instinct of, for instance, Honesty, which is but now in course of formation. Acquired mechanisms are, in effect, structural memories, and the degree of organisation that they attain depends upon the same factors that determine the organisation of other structural memories,

that is to say, upon the amount of the motion under whose incidence they are formed; upon the frequency of repetition of the incident motion; and upon the degree of plasticity of the tissue upon which the motion is incident. In other words, it depends mainly upon the mode of formation of the mechanism, and so falls to be dealt with in the next section.

The amount of motion inherent in a mechanism depends, in the first place, upon the total amount of free motion contained within the nervous system; and it is sufficiently evident in experience that the more energetic and replete with stored motion an individual is, the more strongly do his instincts as well as his other activities assert themselves, and the more effective also are his Determinations, whether instinctive or acquired. But it is equally evident that this applies equally to all mechanisms when once formed, and that it does not account for the relative strength of different Determinations in the same individual. The amount of motion stored in any given mechanism seems to vary with the completeness of organisation of the mechanism, for it is undoubted that the longer it has been in existence, and the more frequently it has been active, the more prone is its activity to be displayed. The subject is too obscure to be profitably followed into detail, but there are certain facts in connection with the supply of motion to mechanisms which are very important.

We have seen, in the instance of the nesting and migrating instincts of birds, how an instinct which is of overwhelming power while it is active may become completely inactive, remaining as a mere structural memory and without any operative effect for a long time together, and then at length revive, and again become the dominant motive of conduct. There are many instincts also which we must suppose to be structurally complete, since when they become active they are perfect in every detail, but which may remain for a long time dormant before they become active at all, or, having been once active, may remain dormant for a time, or for the rest of life. Instances of the first class are the migratory instinct of the young bird, before it has ever made a journey; the instinct of the bee to sting; while of the latter the nidificatory instinct of birds when it is not the nesting season, and the nuptial instinct of the queen bee, are instances. We have seen, too, that certain instincts which are ever present *in posse* do not become active except in the presence of appropriate circumstances, such as the instinct of direct self-conservation from physical dangers. We have

now to note that instincts which are thus present *in posse*, and which are due to become active, but require the solicitation of circumstances to evoke them, or at least need the co-operation of circumstances for their full development, may, if these circumstances are not supplied, remain undeveloped, or at least inactive, and the opportunity for their evocation being once past, the instinct never afterwards attains activity.

FREE-WILL OR CHOICE

Of the two modes of consciousness to which the term Will is ordinarily employed, the choice of alternatives and the persistence in the choice made, we now come to the consideration of the former, which is the process to which the term Volition is eminently and especially applicable. It is around this meaning of the word Will that has raged the secular controversy between the advocates of Freedom of Will and the Determinists, and as one of the most vitally important and the most difficult of problems, it behoves us to examine it with special care.

The difference between these two aspects of Volition is well marked. Choice is an affair of a moment. Determination, with which we dealt in the last section, is prolonged. Choice accompanies reasoned action only, and exists at one momentary phase only of reasoned action. Determination accompanies instinctive action as well as reasoned action. It comes into being the moment Choice is complete, and endures thereafter as long as activity continues.

It is immediately apparent that these two aspects of Volition are precisely parallel to the two aspects of Thought already considered; nay, that there is something more than parallelism, that there is a very close alliance in nature between Volition and Thought Choice implies comparison, and comparison is Thought; so that in Willing there is of necessity a large ingredient of Thinking. And as the process of Thinking is transitory while the resulting Thought remains as a memory, so the process of Willing is transitory while the resulting Will or Determination remains as a memory. To this close alliance between Will and Thought, between Willing and Thinking, we shall recur. Our present task is to discover the determinants of Choice.

While I am walking up a country lane, I meet unexpectedly a pair of runaway horses, and I have to decide promptly how to act so as to avoid disaster. Three alternatives occur to me: I may throw myself

into the hedge on the right; or I may try to climb the wall on the left; or I may retreat to the gate which is twenty yards behind me. I choose one of these alternatives, and the choice is the process of Willing. What is the nature of the process, and how is the choice determined?

When a reaction to a certain impression is found to be effectual in dealing with the circumstances that give rise to that impression, that reaction will be repeated whenever the impression is repeated. The frequent repetition of the circumstances and of the impression will evoke frequent repetititon of the reaction, which, on each effectual repetition, will tend more and more to be repeated in the same form, until a true reflex mechanism is constituted, and the reaction acquires those characters of instantaneousness, inevitability, and determinateness which constitute it a reflex. But if, as in the case supposed, the circumstances which give rise to the impression are unfamiliar, so that no reflex mechanism exists ready formed to deal with them, the reaction that they elicit is neither instantaneous nor determinate. The impression tends to arouse that form of activity which has in the past been found efficient in dealing with similar circumstances; but in the case supposed there have been no very similar experiences. I have never met a pair of runaway horses at that particular place before. I have indeed met different vehicles often in different places, and have had to get out of their way. This I have done sometimes by diverging to the right, sometimes by diverging to the left, according to the amount of room available on the one side or the other; and, where there was no room on either side, I have had to go back. The present experience is similar to these past experiences in some respects, and different from them in others. It is similar to them in conveying clearly to me that I must get out of the way; but it is dissimilar from them all in the absence of any indication as to whether any, and if so, which, side will be left clear for me to pass. Under these circumstances, what happens within me is that all the modes of activity, by which circumstances nearly similar have been previously dealt with, will tend to be aroused, or will be aroused in nascent degree. It is obvious that all cannot simultaneously be effectively aroused. I cannot at the same time diverge to the right and to the left and also go backwards. But all will be aroused, not perhaps quite simultaneously, but in very rapid alternation; and not completely, but only nascently. Then, among these nascent activities, there will be, as it were, a struggle for preponderance. First one and then another of them will emerge into a state of paulo-

plus-nascent intensity, while the others will subside into less intensity; until finally one will assume a high degree of intensity, overpowering the others, which simultaneously subside into quiescence; and this emergence of the victorious activity is the Choice, is the process of Willing.

The period of the struggle for preponderance among the nascent activities is the period of Hesitation or Deliberation; and the mental process so named is the representation of the several activities in succession or alternation, and the comparison of their relation to the present circumstances with their relations to previously experienced circumstances that were somewhat similar to the present. This is clearly a process of Thought, and that it is so is recognised by the phrase which is used to designate it when it is more prolonged and deliberate than in the case at present supposed. It is then designated, and rightly designated, "Thinking the matter over." It is a process of thinking pure and simple; a process of comparison between relations and of the establishment of relations of likeness and unlikeness among them.

The terminal stage of the process, the emergence of the selected activity, is evidently something more than thinking. It is by a process of thinking that the particular activity is determined to be the most appropriate to the circumstances; but there is a manifest difference between judging that a line of conduct is the most appropriate to pursue, and Choosing, Deciding, or Willing to pursue it. The first process may be carried to a satisfactory conclusion, and yet the second may not follow. We may think out an appropriate course of conduct, and there let the matter end; without Willing to pursue that course. For the completion of the Volition a new element has to be introduced. What is this element?

The nature of the element has already been indicated. Thinking may be pursued, while all the representations which enter into the thoughts are of the same faint degree of intensity. Willing is superadded to Deliberation only when the representation of the selected activity receives intensification, and so emerges into the full glare of consciousness, while the other representations sink into obscurity. Our search for the missing element becomes, therefore, a search for that process which can produce intensification of one mental state and suppression or ejection of others; and with this process we are already familiar. It is Attention. Willing, therefore, is the addition of a high degree of Attention to a representation of activity, and of these two

elements, Representation and Attention, and of these alone, is the process of Willing constituted.

Let us see what this position implies.

In the first place it will be objected that attention may be directed to a mode of activity without that activity becoming actual, or being Willed, in the sense already attached to that word; and that, even in the very case that has been instanced, each nascent activity, each representation, was attended to as it arose, and yet all but one were discarded and one alone was Willed. This is quite true; but it does not invalidate the position. The bare statement that has been made needs qualification before it expresses the whole truth. As the representation of each form of activity was brought into the focus of attention, and received in the process a certain degree of intensification, that addition of attention, that intensification of the representation *was* an incipient Willing of that form of activity; and all that was needed for the incipient process to become actual was a further intensification. How often do we not say after a certain course has been decided on and pursued, "I very nearly did something else," "I was on the point of going the other way," "I was half inclined to act otherwise," "I had some thought of behaving differently." All these expressions indicate different degrees of Volition, different degrees of intensification of the represented activity, different degrees of the Attention bestowed upon it. As each of the represented activities comes forward and is attended to, as far as it is attended to it is Willed. The more intense the Attention that is concentrated upon it; the greater the degree of intensification that it receives; the more nearly does it become an operative Volition; and no line can be drawn, no difference beyond a difference of degree can be discerned, between those representations that become operative Volitions and those which are only nearly, or partly, or slightly Willed. There is a gradual transition from states which are but slightly willed to those that are strongly and operatively willed, and this transition undoubtedly accompanies a gradual increase in the amount of attention that is directed upon the activity. The crucial question is whether there is any other element that undergoes simultaneous enhancement together with the enhancement of Attention, and to which, instead of to Attention, the intensification of the process can be attributed. To say that there is such an element, and that the element is Volition, is to beg the question. It has been shown that that phase of Volition, with which we

are now concerned, is made up of two constituents—that it is partly Thinking, and partly a great intensification of the Thought reached. It is known that intensification of the state of mind to which it is directed is one of the properties of Attention; it will be admitted that Willing includes Attention. If, therefore, it is denied that the intensification of the Willed state is not wholly due to Attention—it is acknowledged that it is in part due to Attention—it is incumbent upon the negator to show what other element there is which can and does produce the intensification. What is its nature? How is it characterised? How is it distinguished from the other elements, and particularly from Attention itself? In what does it consist? Until these questions are answered we shall assume, provisionally, that there is no element in Willing beyond Thinking and Attention to the thought reached.

The crux of the difficulty, in admitting that Attention is the sole addition needed to convert Thinking into Willing, is the very great intensification of the Thought which Willing involves, so far beyond what is ordinarily produced by Attention; and the fact that Attention can be, and very commonly is, directed to thoughts of activities without giving rise by the combination to operative Volition. But this difficulty is entirely removed if it be admitted, as I am fully prepared to admit, that the degree of Attention that goes to make up a Volition is greater than that which is reached in Attention ordinarily so called. If we like to give a special name to this exaggerated degree of Attention, and call it Volition, there is no harm done except the addition of another to the already sufficiently numerous meanings of this word. There is no harm done so long as it is admitted and maintained that the thing that we call by this name is an exaggerated degree of Attention. But if any title is given to the conative element which is understood to distinguish that element from Attention, then it must be explained by what sign, other than the name and the intensity, this element is to be distinguished from Attention.

If, instead of beginning with Volition and attenuating the intensity of the Thought until we bring it down to mere Thought plus Attention, we begin at the other end, we shall find that this converse process will yield us corroborative evidence. We shall find, if we trace upwards the gradual increase of Attention, that it becomes at last Will without undergoing any change of nature. When we pay Attention to any form of our own activity, that activity tends to become actual in pro-

portion to the degree of Attention that is paid to it. When we attend closely to a form of words, there is a tendency for the words to be uttered aloud; and the more the attention is concentrated upon the words, the greater becomes this tendency; until at length, when the attention becomes very great, the utterance becomes actual. A person, to whom a question is put that is not quite clear to him, will usually repeat the terms of the question; and so prone are they to do this, that children have to be formally reproved for doing it, and taught to suppress the utterance. Nevertheless, when in after life they become candidates for examination, and when their attention is concentrated with unusual strength upon the questions asked, the process will reassert itself, and they will repeat *sotto voce*, or even aloud, the terms of the question put to them. So, too, when a passage that we are reading is not clear, and we concentrate attention upon it in order to discover its meaning, we are extremely apt to read it aloud. Similarly, when a musician is reading some musical novelty with close attention, he will often hum the air aloud; he will sometimes "play" the chords upon the table before him. When an artist is delineating a face that is to express some particular emotion, he reproduces in his own face the emotion that he is depicting. And, generally, the more closely and persistently a person attends to the representation of any course of conduct, the greater is the tendency of that course of conduct to be actually carried out. When one is tempted to perform some act which is immediately desirable, but which one knows will be ultimately prejudicial; when one is tempted to do that which one ought not to do; it is recognised on all hands that the best way to avoid the temptation is to avoid thinking about it. The more it is thought about; the more it is dwelt upon; the more attention is given to it; the more likely is it that we shall succumb to the temptation. It is, however, in morbid states that the community of nature between Attention and Will becomes most conspicuous, as we shall find when we come to deal with them.

If it is admitted that Attention is the mental concomitant of the emission of motion from the highest nerve regions; and if it is admitted that Willing also is the mental concomitant of the emission of motion from these regions; and, as far as I know, no one who admits the concomitance of mental states with nerve processes will object to making this admission; then it would seem that, if Willing differs in kind from Attention, there should be some difference in the mode of

emission of motion corresponding with this difference in kind. But we have no right to make the assumption gratuitously; and so long as no qualitative difference can be described between either the modes of emission of motion, or the process of Attention and the process of Willing; so long as Attention can be observed to rise gradually into Willing, and Willing to subside gradually into Attention; so long we are not justified in reading into Willing anything but an intenser degree of Attention. That Willing contains Attention everyone will, I think, admit. That Attention, at any rate in its more characteristic form, contains Will, is indicated by its title, "Voluntary Attention." Attention and Willing are certainly and admittedly very intimately intermingled, and it is for those who can discriminate between them to point out in what their difference consists. What is the difference between the Attentive part of Willing and the other part? How much of Willing consists of Attention, and how much of some other ingredient, and what is the nature of this other ingredient? What is the difference between Attention and its Voluntariness? These are the questions that must be answered by those who maintain that Attention and Willing differ in aught else than degree.

But if Attention and Willing differ in degree only, how is it that they have so long been separated as different in kind, or at least as different species of one genus? It is, I think, in the following considerations that an explanation is to be found. The direction of Attention to any state of consciousness intensifies that state; but the Attention and the intensification are so closely associated, are in fact so much the same process, that it is only on a careful introspection that they are discriminated, and by the multitude they have never been discriminated, but are both included under the same name. The outflow of motion, in such quantity as to start a motor mechanism into action, is associated with a similar but greater intensification of the state of consciousness attended to; but this intensification, greater though it be, is immediately drowned by the flood of presented states arising from the movements of the limbs, and the resistances that they meet with. The conspicuous association of Willing is, therefore, not with the primary intensification of the represented activity, but with the secondary intensification of the accessories of this activity, which, being separated from the process of Willing by an interval of time, and having, moreover, the contrasting character of presentation, are readily discriminated from that process. The comparison is therefore not

fairly made. The things compared are not strictly comparable. The intensification which accompanies, and is directly due to, the process of Attention, is compared with the intensification, not which accompanies, but which follows the process of Willing, and which is not directly, but only indirectly, due to this process. But if this secondary and sequent intensification is eliminated, as it can be, the difference also is eliminated. Supposing that I determine upon a course of conduct to be pursued, not immediately, but at some future time. At the close of the period of deliberation there is an intensification of the representation of the chosen activity, and at the same time a subsidence—an active discarding, rejection, and repudiation—of the alternative activities. But these are precisely the effects of the concentration of attention upon any mental state. The state attended to is intensified, and the states formerly alternating or associated with it subside into insignificance; are ejected from consciousness. It is indeed a familiar experience that there is no means of ejecting any state of mind from consciousness except by the concentration of attention upon some other state; and the very fact that the alternatives are dismissed is evidence of the identity of the process of Willing with that of Attention.

Once more, it may be urged that the representation of an activity—of a course of conduct—may be considerably intensified by the direction of Attention to it, and may yet not be a Volition. I may represent a course of conduct, and pay great attention to the representation. I may follow out its details in my imagination, deal with imaginary obstacles, and pursue it in imagination to a triumphant conclusion, without ever seriously intending to carry it out. In such a case there is Attention to a represented activity and yet no Will? The reply is twofold. In the first place, although it is true that Attention is bestowed upon the represented activity, yet the degree of Attention bestowed is that of ordinary Attention only, and is not that Attention, raised to a higher power as it were, which constitutes the active process of Willing. In the second place, the selection of this particular activity for imaginary pursuit *is* a Volition as far as it goes; is a Volition to follow it in imagination; and the subsequent imaginary pursuit is maintained only by the Determination to maintain it; and Determination is the enduring state arrived at by the process of Willing.

As the forms of Attention vary along a scale at one end of which

they are almost purely Reflex, and gradually gain in spontaneity, while they lose in reflexion, toward the other end of the scale, at which they become almost purely Spontaneous; so do the forms of Willing. At one end of the scale of Willing is that choice which is almost wholly solicited by circumstances; at the other is that choice which is almost wholly urged by Desire. In the one case the Will is evoked by *vis a fronte*, in the other it is impelled by *vis a tergo*. In the one case it is the answer to the question, How are the circumstances to be dealt with? In the other it is the answer to the question, In what way shall I expend this overflowing activity? And the questions which we have to answer in connection with them are respectively, Why in these circumstances is this course chosen rather than that? and Why is any regard paid to these circumstances? Why is any choice at all made as to the mode of dealing with them? Why are they dealt with?

Familiar circumstances evoke habitual reactions. Where the circumstances have been experienced in essential particulars, that is to say, in so far as they affect the mission of the organism, in the same form for countless generations, the reaction is reflex action, and reflex action is unaccompanied by Willing. The more the circumstances are familiar, the nearer the reaction approaches in character to reflex action, the more uniform the character of the reaction, and the less of the process of Willing accompanies it. Only as circumstances become unfamiliar, and demand a reaction unlike that which has dealt with previous circumstances, does the active process of Willing come into existence. A coachman, who has been for many years in the habit of driving in frequented streets, forms a habit of passing meeting vehicles on the near side. On the first few occasions, when he was first learning to drive, the traction on the near rein was accompanied by Willing; but the longer he drove, and the more often the reaction to circumstances was actuated, the more did the process of Willing fade away and cease to be concerned in the matter. After years of driving, the reaction is no longer accompanied by Will. It is not even accompanied by Attention. It is performed automatically. When his reactions to vehicles that he meets and overtakes has reached this degree of organisation, he comes upon a cart which is drawn up on the near side of the road with the horse facing him. To deal with this circumstance he has a nervous mechanism already pretty well organised, and without hesitation, that is to say, without any active Willing, he draws his off

rein and passes on the off side. If, however, as he is approaching the cart, he sees that it is already in motion, and will have gained the off side by the time he comes up to it, he passes, still without hesitation, on the near side. But there is a degree of proximity at the time the cart begins to move, when the circumstances will appear equally appropriate for passing on either side, and when both the mechanism for drawing the near rein and that for drawing the off rein will be equally stimulated, and will equally tend to become effectively active. But it is obvious that both cannot become simultaneously active. One must be chosen. A choice must be made. Willing must come into operation; and only when Will is exerted can action take place.

Two things here present themselves for consideration. The first is that this variety of Willing, which may by some straining of language be termed Reflex Will,—the Will that is evoked by circumstances,—comes into being only when the circumstances are unfamiliar, and when a plurality of mechanisms is equally stimulated by them. If the circumstances become familiar, if the coachman frequently meets a cart as it is starting on his near side at a certain distance, a mechanism for dealing with that set of circumstances will soon be formed, and the need for active choice will soon cease.

The second factor that this instance brings into prominence is the factor which determines the choice. The side that will ultimately be chosen will be determined by the degree of likeness of the circumstances to those which habitually arouse the one or the other mechanism. If the horse has got so far across the road that the circumstances are, upon the whole, more like those in which the near rein is habitually drawn, that is the rein that will be drawn, and that is the side on which the coachman will elect, choose, or will, to pass. If, on the other hand, the circumstances are in his judgement most like those in which he has been accustomed to pass on the off, then the off-side rein will be drawn, and he will pass on the off side. "Reflex Will" is therefore in this case, determined entirely by the comparison of the percept of the circumstances to the memory of other circumstances previously experienced; that mode of action being chosen which has in the past been customary in dealing with circumstances adjudged to be similar. And this assimilation of circumstances is in every case the determinant of "Reflex Will"; and in proportion as Will is preponderately reflex, in that proportion is it determined by this assimilation of circumstances.

While, proximately, the choice or will is determined by the assimilation of the percept, or concept, of the circumstances with the memory of previous experiences of circumstances, it is evident that it is determined, in a less immediate sense, by whatever determines the character of this percept or concept, and by whatever determines these memories. The percept is determined partly by what is presented, partly by what elements, among those presented, are attended to, and in large part by memories; and these memories, as well as those in the other term of the relation of assimilation, are determined by the factors that have already been ascertained to be the determinants of memory. Although, therefore, it seems as if, when we are driving one carriage and meet another, we are absolutely free to choose whether we will pass on the near side or the off, the choice that we make is in fact strictly determinate, in the sense that it depends upon enumerable factors. But it is to be borne in mind that these factors, although enumerable, are not ascertainable, and that many of them are quasi-accidental, that is to say, they themselves depend upon factors that are neither ascertainable nor enumerable. The features, in a complex of presentations, that are singled out by attention, are determined by the factors that have been considered in connection with Attention; but in what degree and in what proportion the several factors are present in any given instance, we can never ascertain, and therefore can never calculate the elements in the presentation that will be selected. So, too, the determinants of memory in general are predicable, but the degree and proportion in which these several determinants participate in the appearance of any particular memory, or are present in any particular case, are far beyond our ken. While therefore, in any given case, choice or Willing is determined by factors that are enumerable; is determined so that a bystander who was acquainted with them all could predict what choice would be made; yet, since in practice these determinants are never all known, and even the most important are often unknown, it often happens that no prediction could be offered; and this unpredictability is what is meant by the freedom of Willing.

Granting, however, that the foregoing exposition, of the determinants of the choice made in any particular circumstance, is an accurate exposition, very little consideration is needed to show that it is incomplete; that it accounts for only a portion of the occurrence. Granting that the Willing is the choice of one mode of action rather than another; that it is the activity of one mechanism rather than another;

that the activity is evoked by circumstances that are adjudged to be like one group of circumstances, habitually dealt with by one mechanism, rather than like another group habitually dealt with by another mechanism; granting all this, Will is only half accounted for, for we have yet to explain the power behind the mechanisms, the influence which determines that any action at all shall be taken with regard to those circumstances. In the complex of circumstances surrounding the coachman at the time that he came to the decision to swerve this way or that, there were innumerable elements of which he took no account, and with regard to which he came to no decision, although for dealing with them he possessed apparatus as adequate as that for dealing with the obstruction in the road. There were the shops on either side of the road, the people on the pavement, the rain-clouds in the sky, the train passing over the bridge in front of him, and a thousand other circumstances of which he took no account at all. Out of this complex, he selected, he chose, he Willed, to take account of, and to adapt his action to, a certain restricted group only; the remainder he neglected. The question now before us is, What was it that determined his selection of this group out of all the groups of circumstances presented to him, as the one about which he was to exercise his choice? The answer is sufficiently obvious. "When a man is driving, he must keep his wits about him if he does not want to break his neck." He must keep his attention engaged upon the objects in the road before him, under penalty of incurring a disaster. While he was gazing at the clouds, or the train, or the shops, or the passers-by, he would be liable to run into some obstacle and perhaps break his neck; so he attends to the state of the traffic, and regulates his acts by that. The influence which determines his choice of the circumstances according to which his conduct is to be regulated; the influence which actuates his several mechanisms for swerving this way or that; the influence which determines him to act in these circumstances and to refrain from remaining passive; is, in the last resort, his objection to breaking his neck, or, in familiar terms, his Desire of self-preservation. And whenever we push far enough our investigation of the determinants of Will, we invariably find that, while along a short and obvious path, it leads us to a judgement of the appropriateness of action to circumstances, along another, a longer, and a somewhat less obvious route, it takes us straight back to a Desire, a state of mind to which, in this connection, we

give the name of a motive. There are in fact always two things to determine with respect to the Volition of every act: first, what is it that determines our choice among several alternatives; and, second, what determines the selection of one group of alternatives rather than another as the subjects of choice. Or, as usually put, in every act there is the choice and the motive for the choice; and, while the choice is a matter of judgement and of attention, the motive is in every case a desire, an instinct or a quasi-instinct.

"Dear Sir." In thus commencing a letter, the actual configuration of the words is effected by a mechanism laboriously acquired. To this all will agree. When we determine or Will to write a letter, all that is necessary is to put the mechanism in motion; and that being done, the "Dear Sir" is written automatically. There is, indeed, a choice exerted as to what letter shall follow that last formed; as to what direction, what inclination and extent the next stroke shall take, but this choice is almost entirely predetermined; it is almost purely reflex; it is determined, under influences already considered, by the similarity of present circumstances to previously experienced circumstances; and the particular movement chosen is the movement which, in previous similar circumstances, has been found effectual. Like circumstances have been so often experienced—like words have so often had to be written—that Willing has subsided into Determination, and the greater part of the action is determined by the mechanism. Whatever choice there is in the formation of the words is a reflex choice, and once the mechanism has been set in motion, once the determination to write the letter is formed, no influences beyond those already considered are required to account for the formation of the words. But what does require explanation is how the mechanism comes into activity. How do I come to write the letter? I will, I choose to do so; well and good, what are the determinants of the choice?

Here again the inquiry divides into two branches,—choice and motive, or reflex Will and spontaneous Will. I choose to communicate with my correspondent in writing, rather than by word of mouth, or by sending a verbal message, under the influence of previous experiences of the relative efficacy of these several methods in similar circumstances. That means of communication, that course of conduct, is chosen, which has been found in previous experiences of similar circumstances, most effectual. The choice is determined by

the same factors as determined reflex choice in other cases. But behind this is again the question of motive. I follow the course that seems to me most appropriate for communicating with my correspondent, but what determines me to communicate with my correspondent? I Will, I choose, to do so. What are the determinants of the choice?

Again we are confronted by the same factors,—choice and motive. I can communicate with my correspondent, or I can let him alone; and my choice, as to which alternative I shall adopt, is determined by my previous experience of the efficacy of each course in similar circumstances. The circumstances are that I have a house to let, and that he is a possible tenant; and as I have found, on previous occasions of letting the house, that I got a tenant more readily by communicating with a likely person than by waiting for him to communicate with me, I follow on this occasion the course that I have before found more effectual. But suppose that I have never let the house before, what then? Why then I am determined by the course that I have found most effectual in circumstances that are as nearly similar as my experience provides. I have never let a house, but I have sold something; and I have found that if I have something to sell I shall more readily sell it by touting for a purchaser, than by waiting for the chance of a purchaser finding out that I have that thing for sale, and coming to me with an offer for it. The choice, between communicating with my correspondent and letting him alone, is a reflex choice, and is determined, as reflex choice always is determined, by the similarity of the course chosen to the course which has been most effectual in circumstances adjudged to be most similar. But again behind this choice lies motive. Why make any choice at all? I follow the course which seems to me most appropriate for getting the house let, but why let the house? I Will, I choose, to do so. What are the determinants of the choice?

Once more there are two lines of inquiry to follow, choice and motive. My income is diminished, and as it no longer equals my expenditure, I look round for a mode of equalising them. I may either reduce my expenditure by letting my house and moving into a smaller one, or I may increase my income by taking lodgers. Determined, as before, by the course which has in experience been found most effectual in equalising income and outgo, in circumstances as nearly similar as experience affords, I choose the former alternative; and that done, I am

again confronted with the necessity of accounting for the other factor in the determination—the motive. I follow the course that seems to me most appropriate for equalising expenditure and income, but why do I seek to equalise expenditure and income? Why not go on as before, spending the same though less is coming in? I Will, I choose, to equalise my expenditure with my income. What are the determinants of the choice?

Behind this choice again I find a motive and a choice. My motive is to save myself from future want, and to satisfy this motive my choice is restricted. I must either adjust my expenditure to my income or allow my life to lapse. But behind this choice again is another motive, the desire of self-preservation, and the second alternative of the choice is inconsistent with this motive, so that practically I have no choice. We have now followed our analysis of motive back to a point at which choice ceases, and at this point we find ourselves face to face with a primordial instinct or Desire. This desire we cannot alter, nor can we choose whether our conduct shall be regulated in accordance with it or no. So long as the instinct or Desire of self-preservation exists, so long must our conduct be of the character which seems, in our judgement, best calculated to secure the end to which that instinct points; and no other conduct is possible to us, unless and until that instinct ceases to exist, or is overpowered by some stronger instinct. It may seem that I am as free to choose whether I will terminate my life rather than reduce my expenditure, as I am free to choose whether I will communicate with my tenant by letter rather than by verbal message; but I am not as free. As long as the Desire of self-preservation exists, and is uncounteracted by a stronger Desire, so long I have no alternative but to act in accordance with it. To take up a razor and cut my throat is as impossible to me when I am restrained by internal Desire as when I am restrained by external coercion. As long as desire is efficient, my hands are as effectually tied by it as they would be by cords. I cannot do the act. I cannot Will to do it. Choice, which up to this stage has been so efficient, is now powerless. Here Desire says to Will, "Thus far shalt thou go and no farther, and here shall thy proud waves be stayed."

But, it will be said, although we cannot act in opposition to an uncounteracted desire, surely we can educate a counter desire up to such a pitch that it assumes a power equal or superior to that

of self-preservation, and in this way free ourselves from its bondage? This is a question to which we will return presently, but first there are some consequences of the foregoing argument that require attention.

In the first place, it appears from this analysis that every choice is determined by two factors—the internal factor and the external factor; the state of the organism and the circumstances in which the organism is placed; and that the internal factor consists of two distinct elements, desire and memory, which correspond respectively with the motion that the organism contains and the mechanisms which this motion actuates. In the case which has been instanced, the activity of the organism was first elicited by the impress of circumstances. The diminution of income aroused the desire of self-preservation. This desire, on becoming active, demanded a mode of expression. The motion set free, in the tract of nerve tissue that embodies the instinct or desire, sought a path of egress. Two paths existed. Two modes of equalising accumulation with distribution were already, by previous experience, registered in the structure of the nervous system, or as is here expressed, embodied in structural mechanisms. Equalisation of accumulation and distribution had, in different fields of experience, been effected in two ways—by increasing accumulation and by diminishing distribution. In some circumstances, the one mode had been followed, in other circumstances the other. In the present case, the mode followed was that which had in experience been followed in circumstances on the whole most similar. The judgement as to similarity of circumstances determined the particular mode of action followed, the particular means by which the desire should be satisfied. Without the desire there would be no action at all. Without the particular mechanism, the desire could not have expressed itself in that particular way. The desire was the motive which impelled the choice, the choice was the mode of satisfying the desire. So long as the choice was in suspense, so long as the motion was under tension in the primary mechanism, so long the desire was desire only. As soon as the choice was made, as soon as the motion flowed out from the primary into the secondary mechanism, and filled this secondary mechanism to repletion, so soon did the primary desire, or instinct, of self-preservation become Will to reduce expenditure; and so soon was this will followed by the secondary desire, the desire to reduce expenditure. When this stage was reached, the process of

choice was repeated. The desire to reduce expenditure found expression in the choice of letting the house, and the transfer of motion from the one mechanism to the other was marked by the conversion of desire to Will on the higher stage, and followed by the accumulation of Will into desire on the lower stage. The desire to reduce expenditure is converted by choice into the Will to let the house, and this Will, this momentary process, is followed by the more enduring state of desire to let the house. Each stage is marked by the same changes. The desire to let the house becomes, by choice, the Will to write the letter, and the momentary process of Willing is followed by the more enduring desire to write. Thus, in every process of Willing there is a series of steps, beginning with some primordial desire or instinct, which by choice or Willing is directed towards a specific movement, each process of Willing ending in a state of desire, which is the motive for a subsidiary process of Willing; and so on until the lowest mechanism is set in action and movement results. Desire implies in all cases the state of repletion of a mechanism with motion, Willing implies the process of filling a mechanism with motion. Once the mechanism is full, Willing becomes Desire. In all cases Willing is the choice of alternatives, determined by discerned similarity of present circumstances to circumstances previously dealt with; in all cases motive or desire, when traced back to its source, is found to begin in a primordial instinct. Will is in every case the expression of instinct in ways that have been found in experience appropriate. This expression still needs some expansion.

Instinct is, as we have seen in a previous section, on the physical side, an inherited mechanism replete with motion. The mechanism is an arrangement of nerve tissue, such that the motion that it contains finds egress in ways that are generally determinate. The specific determination of the movements in which the motion is to issue from the organism, and to deal with the circumstances, is provided, as we have seen, by subsidiary mechanisms, which may either be completely and precisely organised, and in that case may be either inherited or acquired under the influence of individual experience, or may be more or less inchoate. The more completely these subsidiary mechanisms are organised, the more unvarying the resultant movements. When the precise organisation is inherited, then the unvarying action is instinctive action ordinarily so termed. When the precise organisation has been acquired in the lifetime of the individual, then the action is

termed automatic or habitual. The less completely organised, the more inchoate, the subsidiary mechanisms, the less instinctive the action, the more is it subject to the influence of choice.

If this statement of the physical nature of instinct be correct, then to the constitution of instinct two things are necessary. There must be an inherited mechanism, and this mechanism must be replete with motion. If either factor is wanting, instinct is absent. The mechanism must be replete with motion. An inherited mechanism that is empty, is an instinct *in posse*, but not *in esse*. In the case of the instinct that we have been considering, that of self-preservation, the mechanism is not usually replete unless and until its motion is evoked by the impress of circumstances, and only then does it become an active instinct; but there are other inherited mechanisms which become spontaneously replete, and the corresponding instincts spontaneously exert themselves. An inherited mechanism without a content of free motion is, however, a possibility. Such is the instinct of self-preservation when not called upon; such is the reproductive instinct in old age; such is the migratory instinct of birds during the season of nidification; such is their nidificatory instinct during migration; and many other instances might be adduced. It is now to be noticed that the converse state of things may obtain, and that there may be in the central nerve tissue a repletion of motion which is not contained in any such structural arrangement as is entitled to the name of a mechanism. The tissue in which it is contained may be so inchoate, so amorphous in structure, that it does not determine, even generally, the direction of the outflow of the motion. In such cases, what will be the state of mind accompanying the repletion, and in what direction will the motion issue?

When motion thus becomes replete in nerve tissue that is as yet unorganised, the corresponding mode of consciousness should be a powerful, voluminous, *undirected* desire, a vague but eager yearning for we know not what; and there are occasions when just such a desire occurs under just such conditions as are favourable for the existence in the central nervous tissue, of a large volume of free and undirected motion. When, at adolescence, the copious demand upon the central store of motion, made by the processes of growth and development, is slackening; while the high rate of accumulation of motion therein is still maintained; when, at the same time, the material from which the reproductive mechanism is to be formed still exists as yet undifferen-

tiated, or only slightly differentiated; then the conditions for the existence of such a repletion of free motion, in tissue that is as yet unmechanised, would seem to exist; and then experience shows that there is apt to exist just such a consciousness of powerful, voluminous, undirected desire as has been mentioned.

In what modes of activity will such vague, undirected desire find expression? What kind of conduct will they immotive? *A priori* one might expect that either the movements in which such motion will issue would be of the same vague, voluminous, and undirected character as the desire itself, or that it would fan the embers of expiring instincts, and actuate a mode of conduct which, with reference to the present circumstances of the organism, was archaic. To actuate instincts that were still operative and useful it would not need, since these instincts must first be satisfied before any such store of undirected motion as has been supposed could exist. With this *a priori* supposition the observed facts harmonise. Such vague, voluminous, and undirected desire does find expression in the ways indicated. When they immotive vocal utterances, these utterances take the form of song on the one hand or of poetry on the other, forms of utterance that, by their strenuousness, indicate the copious expenditure of motion that their production involves; and whose character mirrors, in the voluminousness and vagueness of the states of consciousness that they communicate to their hearers, similar characters in the state which is their motive. Another mode of conduct immotived by the same undirected desire is religious observance, and the same quality of absence of precision, of vagueness and voluminousness, is characteristic of the utterances of religious ceremonial; while the rest of the ceremonial must serve no specific end for the individual who takes part in it, or, as far as it does so, it ceases to be religious. That is to say, it is undirected activity. Directed as far as immediate object it may be, but directed as to ultimate object it is not. Whatever specific ends are pursued at the instance of this superfluous and primarily undirected desire, are ends indicated not by instincts that are immediately concerned in the present conservation of the organism, but by instincts that have had their day and served their purpose, and are now become obsolescent. Whatever meed of motion is required for the immediate service of the organism, for its present and urgent needs, does not find its way to such obsolescent mechanisms; but when all present needs have been satisfied, and superfluous motion is still left over, it may find

its way to these dormant instincts and set them in activity; and once they are active, the expenditure of their activity will be determined by the choice of subsidiary mechanisms in the way already indicated. Thus it is that recreative activity so frequently finds its expression in the satisfaction of archaic instincts, the instinct of combat and the instinct of chase. Upon these instincts all games are founded.

Recreative activity, that mode of desire which is merely a desire to expend motion, and is indifferent to the way in which the motion is expended, the desire which accompanies the mere repletion with motion of undifferentiated nerve tissue, is, when it finds expression in any specific mode of conduct, the purest example of Spontaneous Will. It is that form of Willing which is the least determined by circumstances and the most purely due to internal initiative, and the choice of the particular mode of activity in which the desire for recreation finds expression is the occasion of choice in which choice is most "free," in which the determinants of choice are least conspicuous. The conditions, that determine the choice of the particular subsidiary mechanism in which recreative activity is to express itself, are therefore very important, since they are the key to the problem of "freedom of Will." The physical condition is, as we have seen, a volume of free motion seeking egress from unmechanised nerve tissue. What determines its egress through this mechanism or through that? The problem is an obscure one, and it is not likely that we can identify all the factors, but some, and those the most important, can be identified; and whatever the factors may be, we have no warrant for supposing that, in the egress of motion from unmechanised nerve tissue, there is any factor that is wholly absent in determining the direction of the egress of motion from partly mechanised nerve tissue. If the latter is explicable on mechanical principles, there is no reason for supposing that the former is not so explicable, or for introducing in the one case more than in the other a non-mechanical factor.

The unmechanised area in which we have supposed motion to be replete is undoubtedly in physiological continuity with mechanised areas. If it were not so, its contained motion could find no egress, and *cadit quæstio.* As it is continuous with mechanised areas, then, other things being equal, motion will flow most readily in that direction in which the tissue is most permeable to motion. But this most permeable direction is (see "Memory") the direction in which motion has most often and in largest quantities issued. Other things being

equal, therefore, recreative activity, or desire, will find expression in customary ways; and that form of recreation will be followed, will be chosen, which is most customary. That this is true, our daily experience of ourselves and of others sufficiently shows. But this is clearly not the only determining factor. Other things are not always equal.

Let us eliminate this factor by supposing that the channels of communication with neighbouring mechanisms are all equally permeable. Then it is clear that, other things being equal, that mechanism will first become replete, and will start into activity, which was most nearly replete before the added motion was received; and other things being equal, this most nearly replete mechanism will be that which has longest been inactive, and has therefore had the longest time to accumulate motion. Other things being equal, therefore, recreative activity will be expressed in modes of action that are most unlike the modes of action that have been most recently and most continuously followed. And this we find to be the case. The man whose customary occupation is sedentary, finds his recreation in muscular exercise, and *vice versâ*. The man whose occupation is followed in a town, finds his recreation in visiting the country; the man whose occupation is followed in the country, finds his recreation in going to town. The same principle determines the frequent choice of archaic instincts as modes of recreation. Being archaic, there is no opportunity for them in the serious work of life; they are left unexercised, and if the mechanisms are not wholly atrophied from disuse, they gradually accumulate motion, approach repletion, are accompanied by desire, actual or nascent; and, on the addition of a flood of additional motion, they readily start into activity.

In determining recreative, as in determining other modes of activity, the tendency to imitate the action of others is important, but this need not be considered here, since it is dealt with at a future stage.

From these considerations it appears that recreative activity will express itself in animating those instinctive mechanisms that are most nearly replete with motion, and whose activity is most customary. But by recreative activity is here meant the existence of free motion in a central unmechanised portion of grey matter; by the expression of this activity is meant the direction in which this motion finds egress. And it has already been explained that what we have called recreative activity is the physical substratum of Spontaneous Will, so that the

determinants of the one are the determinants of the other. In other words, as Reflex Will is a function of, and is determined by, the external circumstances in which the organism is placed, in combination with the registered memories of the organism; so Spontaneous Will is a function of the relative repletion of mechanisms in combination with registered memories. The one is as fully and completely determined by physical conditions as the other, and, in the one case as in the other, if these conditions were known, the action taken by any organism could be accurately predicted. Then if action is completely determined in all cases by physical conditions, the Will is not Free? This depends entirely upon what is meant by Freedom of Will. If it means that "I" am free to project the free motion of my central nerve regions in a direction of greater resistance rather than in a direction of less resistance; if it means that a desire of greater intensity, a mechanism more fully surcharged with motion, can be overcome by a desire of less activity, a mechanism less fully surcharged with motion; if, in short, it means that "I" am free to entertain such instinctive desires as "I" please, then the will is not free. The cat is not free to desire to swim; the swallow is not free in autumn to desire to remain in its northern nesting-place, nor at any time to prefer walking to flying; the whale is not free to desire to live on dry land; nor am I free, when I am hungry, to desire not to eat, nor when I am thirsty to desire not to drink; nor, if an accession of fortune is contingent on my being at a certain place at a certain time, or on my finishing a certain task by a certain date, am I free to refuse to desire to be at that place, or to finish that task by that time. Whether I shall act so as to satisfy these desires depends upon whether they are or are not counteracted by a stronger desire. If I am hungry and thirsty, but cannot satisfy my appetite without crossing a bullet-swept area, to cross which is certain death; or without swimming across two miles of sea, which I know is beyond my power; the more immediate and urgent desire of self-preservation will overcome the desire for food or drink, unless and until the latter desire rises to a pitch which renders death preferable to endurance.

These truisms will scarcely be accepted, however, without further examination. Doubtless, in every case of Spontaneous Willing, as in every case of Reflex Willing, there is a conflict between rival activities, and that which is stronger obtains the preponderance. But we have seen how, in the case of Reflex Willing, this preponder-

ance is gained by the influx, into the nascently active mechanism, of a flood of motion from some higher or more central source; and that it is this influx of motion which is accompanied by the consciousness of Willing; and it is natural to ask whether a similar influx of motion does not determine the choice of the spontaneous activity. The deliverance of consciousness in this respect is very significant. It seems often to tell us unmistakably that, of two activities that are struggling for preponderance, that which appears to us the stronger is overcome by that which appears to us to be in itself weaker, but which seems to obtain preponderant strength by the addition to it of power spontaneously furnished by the "self." When a hungry man passes a baker's shop, the desire to satisfy his hunger, by taking some of the good things he sees displayed, may be very powerful; but it is overcome and nullified by a desire which, since it overcomes the other, must be more powerful, but which yet does not in itself appear to be so. It appears as if the desire to behave honestly was not in itself of greater magnitude than the desire to satisfy hunger, but that it becomes greater; it is made greater by the strenuous exertion of the "self"; by the spontaneous addition to it of adventitious strength from outside itself. The original weakness of the higher motive, and its reinforcement by added efficacy, is plainly apparent in the consciousness of Effort that accompanies the process. The desire to satisfy hunger at the expense of the baker may be so intense that it requires a strenuous struggle, a struggle in which Effort becomes conspicuous, to overcome it; and it is, so consciousness tells us, by this added increment, and not by the original superiority of the desire to do right, that the latter at last prevails. Such is the deliverance of consciousness, and the deliverance of consciousness we are bound to accept. But our very obligation to accept the deliverance of consciousness as final, places upon us the additional obligation to distinguish between the primary occurrences in consciousness and the inferences that we secondarily draw from these occurrences.

That a primordial, and therefore a very deeply rooted and powerful desire, such as that of gratifying hunger, may be overcome by a much more lately acquired, and therefore a presumably intrinsically weaker desire, such as that of honesty, there is no question; nor can we question the declaration of consciousness that a struggle takes place between the desires, and that that which has been more lately acquired, and is presumably intrinsically weaker, gains a preponderance over the

older and presumably stronger, by the help of an accretion from some more central or higher source. The problem is precisely that of the re-creative activity over again, but in a slightly different sphere. No doubt motion is poured into the newer mechanism, and no doubt it is by the addition of this draught of motion that this mechanism is enabled to gain the preponderance over the other. No doubt, in the highest or most central arcanum of the nervous system, there exists an unmechanised territory from which motion is dispensed into neighbouring mechanisms; but not at random; not by caprice; not at the instance of any presiding and directing "self"; but under the infrangible laws of communication of motion. If the one instinct-mechanism receives from this central store of motion an addition which the other instinct-mechanism does not; it is not because the "self," the ego, spontaneously and capriciously directs it towards the one as a favourite rather than to the other which is in disfavour, but because the ways by which motion travels are more readily permeable in the one direction than in the other; and this raises once more the question that so frequently arises, What is it that determines the permeability to motion of nerve tissue? What it is is fully discussed in the chapter on Memory, and all that remains to do here is to show in what way the general case applies; in other words, how this process, which renders nerve tissue permeable to motion, has come to take place in the direction of the newer instinct-mechanism rather than in the direction of the older.

The explanation is twofold. In the first place, the tendency of a well-established mechanism to attain to a quasi-independence has already been noticed. It has been shown that the more frequently a form of action has been repeated, the more does that action tend to be repeated; how, with frequency of repetition, Effort diminishes until at length it disappears; Attention lessens until it disappears; and, with attention, of course Will also disappears. The mechanism then attains to a quasi-independent and quasi-parasitic existence. Not only is no Will—is no centrifugal draught of motion into it—necessary to start it into activity, but, when the process is complete, no Will, no inhibitory draught of motion, is sufficient to suppress it. When the eye is tickled, no exertion of Will can arrest the blink. When the glottis is tickled, no exertion of Will can arrest the cough. When the pharynx is tickled, no exertion of Will can arrest the retching. As with reflex mechanisms, so with spontaneously acting mechanisms, the

more completely organised they become, the more do they become independent of the central store of motion; the more self-sufficing is their own intrinsic store; the more do they take on a quasi-parasitic character, and tend to become independent of Will, both in their occurrence and in their subsidence. It is this semi-independence of instinct-mechanisms, it is this aptitude of theirs to accumulate motion in their own precincts and without needing reinforcement from the central store, that places the occurrence of desire beyond the control of Willing, which is, on the physical side, this very outpouring of motion into a mechanism. The more of such motion that issues from the central reservoir to the mechanism, the more of spontaneous Will is associated with the working of the mechanism, and *vice versâ*. When the desire to satisfy hunger at length gains the preponderance over the desire to act honestly, the final determination is known in consciousness, not as a wilful reinforcement of the instinct by Will, but as a letting go, a passive acquiescence in the assumption of the activity by the instinct-mechanism. The instinctive activity is not urged on by Will, but is merely allowed to take its own course. In the case of reflex mechanisms, we see that the complete organisation of the mechanism cuts it off from communication with the higher regions of nerve tissue, so that interference with its action by descending motion is impracticable. The same is the case, though not to quite the same extent, with spontaneous mechanisms. They too, by the very completeness of their organisation, are self-inclosed and debarred from receiving motion from more central tracts. In this we see a partial explanation of the greater copiousness of the stream of motion which flows toward the more recently and less completely organised instinct-mechanism of Honesty, as compared with the scanty supply that reaches the older and more completely organised instinct-mechanism that actuates the satisfaction of hunger. But there is another influence also that is powerful in the same direction. Before the occasion arose on which the two instincts came into conflict, there had been formed a Determination to act honestly upon occasion arising; and, as we have already seen, the formation of a Determination is the formation of a mechanism. It is the arrangement, more or less definite according to the degree of organisation attained, of nerve tissue, in such wise that, *inter alia*, where motion has passed, a path is cleared by which motion can more easily repass. But a Determination is a mechanism formed under the influence of Will, formed

by the issue of motion from the central reservoir of motion, and therefore between this central reservoir and the mechanism a path will, in the early life of the mechanism, lie open for the easy transference of motion from the one to the other. There are therefore two good reasons why spontaneous Will, which is the special accompaniment of the outflow of motion from the central unmechanised reservoir of motion, should be strongly associated with the instinct of Honesty, and should not be so associated with the instinct which honesty overcomes.

In any case, however, whether so re-enforced or not, that instinct triumphs which is at the moment stronger—which is at the time the more replete with motion, whatever the source of that motion may be. In the struggle between honesty and desire for food, for instance, a graduated scale may easily be made, at one end of which honesty would triumph automatically and with everyone of the most rudimentary morality, while, as hunger became more intense, a higher and higher degree of honesty would be required to overcome it, a larger and larger proportion of persons would succumb to the increased temptation, until at last a mere remnant would be left, in whom the instinct of honesty would be sufficient to overcome the pangs of utter starvation.

Our review of the phenomena of Volition leads us therefore to the conclusion that the higher nerve regions, like the lower, are made up of mechanisms in states of organisation more or less complete; that the highest or most central region of all is a tract of unmechanised nerve tissue, whose activity is in a special degree identified in consciousness with the activity of self; that the outrush of motion from this central tract is the physical process which is accompanied by that keen awareness of activity which, when of low intensity is called Attention, and when of high intensity is called Willing; that the motion therein contained can issue only through the mechanisms, of various degrees of organisation and in series of various numbers of steps, that lie between it and the musculature; that of these mechanisms some, the lowest and most completely organised, are entirely shut off from access of motion from the central tract; that others admit of access of this motion in various degrees; that around the central tract are groups of spontaneous mechanisms which have attained so high a degree of organisation that their activity is in large degree, it may be almost wholly, independent of provocation by the inrush of motion from the

central tract, and due largely or almost wholly to the motion independently accumulated within their own borders. These mechanisms are the physical bases of instincts, and their repletion with motion is the basis of instinctive desires, which, as the motion with which they become replete is not derived from the central tract, are outside the very self, are not subject to Will, and are quasi-parasitic upon the self; that when one of these instinct-mechanisms becomes spontaneously and preponderantly active, it actuates the organism, which has no alternative but to follow its lead; while, when more than one such mechanism become simultaneously active, the stronger obtains the preponderance, and determines the direction in which the organism shall become active; that the magnitude of the activity may be due solely to the inherent motion accumulated within the mechanism, or may be in part due to reinforcement from the central reservoir of motion, but in any case the stronger will prevail; that while the general direction of the activity of the organism is determined by the structure of the spontaneous mechanism which originates the course of conduct, the specific details of the conduct will be determined by subsidiary mechanisms, which may be either, like the primary mechanism, inherited, or may have been acquired in the lifetime of the individual; that the degree to which the details of the conduct are predetermined by inherited mechanisms varies much, some conduct being determined down into precise details, and receiving the title of instinctive conduct, while other conduct is determined only in general, and receiving the title of reasoned conduct, although the difference of instinctive conduct and of reasoned conduct is but a difference in the degree to which the details of conduct are determined by inherited mechanism; that the reasoned portion of conduct is that portion which is dealt with by acquired mechanisms, and that the particular mechanism concerned in a reasoned act is determined by a comparison of the present experience of the circumstances under which the act is performed with previous experiences of circumstances under which acts have been performed for the satisfaction of the same instinct, that course of conduct being chosen which had previously been found most successful in circumstances most similar; that the choice or Willing is in this case, as in the previous cases, the rush of motion from a more central tract of nerve tissue into the chosen mechanism.

The difference between the determinist and the indeterminist is that, while the latter maintains that we can will as we like, the former main-

tains that we must will as we like. The latter is shocked by the contention that our will is in thrall to our desires; but, according to the former, our desires constitute that very self which wills. The active Ego is the algebraic sum of instincts and determinations, and cannot but act in accordance with them. The will is then free in its choice of means and fixed in its choice of ends? Not altogether free even in its choice of means, since we can choose those means only which appear best adapted to achieve our ends. But are we not free to determine which of two motives shall at the moment be stronger? I am torn by duty and racked by love. I desire to go on with my work, and equally desire to go out and enjoy the fresh evening air. Can I not freely choose which I will do? I interrogate my own mind and get from it what seems an unequivocal affirmative. But then upon consideration I find that, supposing the two desires to be equal, my choice must ultimately be determined by the degree to which I have inherited or acquired the power of postponing a lesser immediate pleasure to a greater prospective pleasure, and this power is in some way organised in the structure of my brain. The difference between the determinist and the indeterminist is that, while both regard the process of Willing as the equivalent of the outflow of motion from some central region of the nervous system, the former regards this motion as stored and distributed in conformity with known mechanical laws; the latter regards it as flowing in from some fourth dimension in space, and distributed without regard to mechanical conditions. It is water which may flow uphill; it is movement not in the direction of least, but of greater resistance.

In the doctrine that volitions are determined, there is nothing to lead us to sit down impassive or to disavow responsibility for our acts. Granted that every act is determined by the relative strength of desires, this is no justification for letting ourselves drift. The crux of the matter is that we can never know which motive is the stronger until we have made the trial. It may be that the attraction of present indulgence is so powerful that our utmost effort to overcome it will be ineffectual; but this is just what we cannot know until we have tried, and is no justification for refusing to make the effort, or for neglecting to urge the effort to its maximum. What is really meant by Freedom of Will is unpredictability of conduct. When the data are clearly represented in consciousness, it is impossible to doubt that the direction in which motion passes is determined by physical con-

ditions—that the form and pattern of a wreath of smoke in the open air, is as determinate as the form of the stream of water that flows in a tube; that the play of colours exhibited by a drop of tar floating on water is as determinate as the play of colours in a picture. But in the one case the conditions which determine the result are known, while in the other they are not merely not accurately known, not measurable or estimable, but they are not even enumerable. The savage sees that the lightning is free to strike here or there, to select this tree rather than that. We know that it is not free, but determined by physical conditions, and that what he calls freedom in the lightning is really his inability to predict its incidence with precision, and to estimate the factors which regulate it. We are in the same position with regard to human conduct as the savage is with regard to the conduct of the lightning. A savage might well suppose that a clock strikes the hours of its own free will. When he had known clocks for some time, he would gather that their striking was regular, was subject to law, and from his ability to predict exactly what hour it would strike next, he would gather that it was not free to strike otherwise. The clockmaker knows exactly, not only the laws to which the striking is subject, but the mechanism which enforces these laws. Again, the movements of the planets are regular; we know the laws which they observe, and we know also the conditions which determine this regularity of movement; and we say that they are not free to move as they will. Kepler knew that they were subject to law, but he did not know the conditions which determined the regularity, and to Kepler, while the planetary movements were not free, yet there was no reason why they should not be or should not become so. Primitive observers of planetary movements, who witnessed the movements but were unable to trace any regularity in them, regarded them as free. They were celestial intelligences who moved as they liked. Towards the migratory movements of birds, we are in the same position as was Kepler towards the planetary movements. We see that they are subject to law, but we know not the conditions which determine this regularity. Towards the conduct of mankind, we are in the same position as the earlier observers were with respect to the planetary movements, or the savage with regard to the incidence of the lightning. We can trace neither the conditions which determine regularity, nor even regularity at all. Hence to us, human conduct is free. But if we could trace the laws to which it is subject, we should no longer look upon conduct

as free; and in fact, in those circumstances and instances in which we can trace regularity in conduct, we do not regard it as free. To a higher intelligence, to which both the empirical laws to which conduct in fact conforms, and the conditions which determine its regularity, were alike known, conduct would cease to be free. Thus, by Freedom of Will is meant, as aforesaid, unpredictability of conduct.

CHARACTER

Character is a term which shares the fate of other terms used in psychology, especially those of long standing and those which have been adopted from the vernacular, in being understood by most users of it in a very vague sense, and by those who attempt to restrict it to a single meaning in a sense different from other such users. It has been defined as the sum of tendencies to action, possessed by any individual, and the definition is a good one save for the ambiguities that lurk in the words tendency and sum. It is manifest however that tendencies to action are and must be estimated by our observation of acts that have been performed, and that when we speak of tendencies to action we really mean observed modes of action. From the way in which a person has acted in past circumstances we judge of the way in which he will act in future circumstances that are somewhat similar, and when we speak of his tendencies to future action we mean his mode of acting in the past. Character may therefore be defined as the way in which a person is accustomed to act. The term is often used to denote the way in which he is accustomed to act in circumstances of a particular class. For instance, if under circumstances requiring the expenditure of money, he is accustomed to spend it with reluctance, to spend as little as possible, and to refrain from spending if spending can possibly be avoided, his character is termed penurious. If in circumstances of physical danger he is accustomed to expose himself freely, and rather to court than avoid danger, he is called a man of courageous or rash character; and if he exhibits the opposite course of conduct his character is termed cowardly. In each of these cases the term is applied to a portion only of the whole character of the man. He may be penurious in one set of circumstances, and courageous in another; in a third he may show himself conceited, and in a fourth indolent; and each of these modes of action may be and

often is, called his character, with the implied limitation that it is his character with respect to one special class of circumstances; but the term is perhaps more properly applied to the sum of all customary modes of action in circumstances generally, or of all classes; and it will be acknowledged that his character is not completely described until it is known what his customary mode of action is in circumstances of all classes. Now it is obvious that, when used in this sense, the character depends entirely on the character of the mechanisms in which the superior regions of the nervous system are arranged, and chiefly upon the relative degree of organisation of the inherited or instinctive mechanisms. There is however another sense in which the term is used, as when we speak of a man as of weak or of strong character. When used in this sense, what is understood by the term is the persistence of his determinations, or the tenacity with which he adheres to a course of conduct once chosen. It is clear that this meaning also is included under "customary modes of action," but it is clear also that by mode of action in this case we mean something different from what we have previously understood by that expression. We then meant the direction that activity took, we now mean the persistence of the activity. In either meaning of the word, character rests mainly upon inborn inherited qualities, upon the structural pecularities of the nervous system in the one case, and in the degree of persistence of acquired structural changes in the other; and although the structural changes are themselves acquired, the ease with which they become persistent is not acquired; it is an inherited capacity.

In one of its ordinary senses, character means therefore the whole group of inherited instinct-mechanisms. A group which is the same for all men in respect that all possess the same instincts, and that there is a general similarity among all mankind in the relative degrees to which the respective instincts are developed; and thus those literary masterpieces in which the conflict of primary instincts is depicted, remain as interesting and as true for us in these latter days as they were to the contemporaries of Shakespeare, of Dante, of Sophocles and Euripides, and of Job; and this sameness in the nature and number and general relative preponderance of the primary instincts, is the basis of the old and trite and very incorrect saying, that human nature is always and everywhere the same. The saying is incorrect, for although all men possess the same primary and fundamental instincts,

and although in all men there is a certain general agreement in the degree to which these instincts are severally developed, yet the precise degree of relative development of each instinct is alike for no two individuals. As in all men the external physical features have a certain general resemblance, and yet no two are so closely alike as to be indistinguishable; so it is with the conformation of their nervous system. All are alike in the main features, but within this general resemblance there is an infinite variety, so that no two characters are exactly alike.

Between external structural features and those internal structural features upon which character depends, there is this further resemblance, that both sets of features undergo profound modifications at successive stages of life. As the individual passes through, in the course of development, the whole series of external forms by the successive assumption of which his ancestry have arrived at human status, so does he pass through the several phases of character by the successive assumption of which his ancestry have arrived at the status of civilised man. In childhood he has the character of the savage superposed upon the simian. He is combative, imitative, predaceous, untruthful, and cruel; he clings to custom with tenacious persistence. In his addiction to hero-worship he reproduces the tribal subjection to the demigod chief; in his addiction to tree-climbing he reproduces a still earlier phase of ancestral existence. In addition he is lacking both in deliberation and in determination. His modes of action being comparatively few, the number of competing modes is small, and for a prolonged period of deliberation there is no need. Moreover, the habit of deliberation, which grows up only as competing modes of action become numerous, is not learnt. Hence the conduct of the child, like that of the savage, exhibits little deliberation. Its instincts find expression instantly and directly, and conduct which is the instant and direct expression of primary instincts is called impulsive and passionate. Impulse and passion are, then, prominent in the character of the child as they are in the character of the savage. At puberty a new instinct, or rather a whole set of instincts, of which only the rudiments existed before, are added to the character. The instincts whose mental equivalents are known as sexual desire, love, sexual modesty, and sexual jealousy then attain to prominence; and, under this addition, the character undergoes a profound modification. A little later in life, social instincts, hitherto dormant, are added, and

at the same time some of the more primitive instincts lose strength not only relatively but absolutely. The desire of approbation, under the name of Ambition and its congeners, becomes prominent, while adherence to custom gives way to a certain, often exaggerated, craving for the disregard and even violation of convention. The combative instinct and hero-worship are still prominent, but cruelty declines and sympathy advances. At the same time the religious instinct attains a high degree of development. In middle life the group of sexual instincts declines in activity, and their place as the main incitors to conduct is taken partly by the parental instinct, partly by the instinct of ambition, and largely by the instinct of accumulation, which now tends to become predominant, and which usually maintains and even increases its predominance as life advances. "A man can no more part old age and covetousness than young limbs and lechery." The instinct of self-preservation, which is highly developed in children, in whom it is apt to exhibit itself as cowardice, undergoes a great diminution as the sexual activities develop, and with the decline of these activities reasserts itself, and in later life becomes often more pronounced than even in childhood.

FAULTS OF VOLITION

In dealing with disorders of sensation, we discovered that there are many sensations, which must be ranked as morbid, which are yet not due to any error in the process of sensation itself: that is to say, they correspond with no disorder in the working of the superior nerve processes, but with some disorder in the degree or mode of the motion which reaches these processes. To this disorderly motion the nerve processes faithfully respond by modified action, and modified sensations correspondingly arise. But the action of the highest nerve region is not disordered. To the mode and amount of the motion that it receives, it normally and accurately responds; and if, under such circumstances, its action were not modified, but were to remain the same as in normal circumstances, and were to be accompanied by normal sensations, then indeed would its action be disordered. A morbid sensation does not, therefore, necessarily imply disorder in the highest nerve region, but on the contrary, the vast majority of morbid sensations imply that the highest nerve regions are performing their duty faithfully and well.

With disorder of Volition it is different. Volition accompanies the emission of motion from the supreme nerve tract, and any disorder of Volition can have no other origin than disorder in the mode of emission of motion from this tract; so that, while morbid variations of Sensation need not imply disorder of the highest regions of the nervous system, morbid variations of Volition do of necessity imply such disorder.

DEFECT AND DISORDER OF ATTENTION

Taking first the case of involuntary or reflex Attention, we find that there are states, both normal and morbid, in which this is defective. In all states, such as coma, syncope, and profound slumber, in which the action of the highest nerve regions is abolished or suspended, reflex attention is completely absent. So long as these states endure, no impression on the senses, however powerful, evokes the slightest reaction from the highest nerve regions, and, as there is no emission of motion from these regions, there is no Attention. In sleep, if motion is communicated to the body in sufficient quantity and intensity to make its way to the highest nerve regions, and to evoke their action, sleep is at once brought to an end; and the first events in consciousness are the occurrence of the sensation that corresponds with the ingoing motion, and, simultaneously with the sensation, the direction of Attention to it.

Without being totally absent, reflex attention may be deficient in various degrees, both physiologically and pathologically.

If the physiological basis of Attention is the emission of motion from the supreme tract of nerve tissue, it is obvious that Attention will be most easily evoked when this tract is most replete with motion, and will be more difficult to evoke in proportion as it is depleted. Accordingly we find that in youth reflex attention is excited by the most trivial changes of impression; that children are alive with eager curiosity to notice, to attend to, everything that is going on within the purview of their senses; while, as age advances, the arousal of reflex attention requires a stimulus that is either stronger in itself, or that obtains an added strength from some adventitious circumstance associated with it. Accordingly, we find that reflex attention is most readily aroused in the morning, when the nerve tissue generally is most replete with motion; less readily aroused toward the end of the day,

when the tissue has been depleted by the daily expenditure; and least readily aroused in conditions of great fatigue and exhaustion.

There are pathological states in which the store of energy in the central reservoir is much more completely exhausted than in any physiological state of fatigue, and in such conditions reflex attention is more conspicuously absent. The pathological state of stupor is an example. This condition is characterised by an abeyance of all manifestation of the action of the superior nerve regions, among which actions that which underlies Attention occupies so large a part. The patient stands with drooping head, with staring eyes, with dropped jaw and hanging arms; saliva dribbles and hangs in ropes from his mouth, and to sensory impressions he appears wholly inattentive. Some at least of his lower mechanisms retain a portion of their efficiency. If he is dragged or pushed along, he walks; if he is sat down to a table with food before him, he may feed himself; and, if food is put into his mouth, he will usually chew and swallow it. Sometimes an instinct, such as that of prehending food, or of reproduction, shows a low grade of activity; but the higher functions of the nervous system, and with them the basis of attention, are absent. Call him by name, shout at him, shake him, slap him, pinch him, he makes no response, no movement; he maintains his stolid unresponsive demeanour. In exaggerated forms of the malady he will even allow flies to enter his open mouth, and to crawl upon his open eyes, without closing the one or the other. Attention, both reflex and voluntary, is completely absent.

In states of dementia, attention, both voluntary and reflex, is diminished to a degree corresponding with, and marking, the depth of the dementia. The whole aspect, demeanour, and conduct, where conduct is present, of the dement, indicate the reduction in the amount of outflowing motion. Spontaneous movements are diminished in various degree down to almost complete absence; and, in the deeper degrees of dementia, no evidence of spontaneous attention is given. Even reflex attention is sluggish in its occurrence, and is but faint and transitory when it is at length aroused. We have to speak to them several times, to shout at them, perhaps to shake them, before their attention is sufficiently aroused to answer our question; and when we have with difficulty elicited a single brief answer, they lapse at once into listlessness, and have again to be shouted at and shaken to gain their attention to a second inquiry. A frightful accident may

take place before their eyes, the house may be on fire, or their lives in danger in various ways, without eliciting from them any sign of attention, without it being possible to obtain from them any account of its occurrence.

There are other morbid states in which the attention is unduly sluggish in its movement. Undue delay in answering simple questions is a common feature in various states of diminished energy. A question is put to the patient and meets with no response. It is repeated, perhaps more than once, and not until after this repetition is an answer elicited, but when the answer is made, it is an appropriate and intelligent answer. In such cases, which are very common, the sluggishness in the movement of attention is the most conspicuous mental defect.

It is manifest that voluntary, even more than reflex attention, must be diminished when there is any diminution in the amount of motion stored in the central reservoir of the nervous system; for voluntary attention is the accompaniment of the spontaneous outflow of motion upon minimal provocation, an outflow which will not occur unless this reservoir is replete with contained motion. Stimulus, or added motion, will still elicit a discharge from a nerve region when that region is not sufficiently replete to discharge *proprio motu*, and a strong stimulus will elicit a discharge from a region which fails to respond to weak stimuli. So that voluntary attention will become defective, and will fail, with degrees of exhaustion in which reflex attention can still be aroused; and generally, the former will fail earlier and more completely than the latter. When the nervous system generally, and its supreme region in particular, is deplete of motion, voluntary attention will fail first and most. When the store of motion is reconstituted, voluntary attention will return last and least.

That this is true in physiological circumstances is exhibited by the common arrangements of life. To work out new and difficult problems; to turn and rivet the attention voluntarily upon matters that are not intrinsically attractive or pleasurable; to engage in tasks that require the highest efforts of voluntary attention; the time chosen is the early part of the day, when the recuperation of sleep has filled the stores of motion to their fullest efficiency; while the later part of the day, when much of the stored motion has been dissipated, is reserved for the exercise of that form of attention that can be exercised with more deplete nerve tissue; for the reflex attention that is elicited by specta-

cular displays, by dramatic entertainments, by music, by the perusal of books merely for the interest they excite, and so forth.

The central focus or reservoir of the bodily energies, the emission of motion from which is the physical counterpart of Attention and Will, is the place at which the whole of the various activities of the body, both those by which the organism acts upon its circumstances and those by which its various internal functions are actuated, are co-ordinated, harmonised, and integrated. It is the place at which all the local and partial activities of the body are represented, and are combined into the action of the organism as a whole. It is the place at which the process of combination, of integration, has reached its highest development; and consequently, when it acts, it acts as a whole, and this unification of its action has its counterpart in the unification of consciousness. That the individual feels, knows, and acts as a single individual, is due to, is the reflection of, the unification or integration of its highest and most central tract of nerve tissue. Were this tract not integrated, were its different parts free to act severally, the personal identity would be confused, uncertain, ambiguous. In some cases it does actually appear to be imperfectly integrated, and then occurs the strange condition that is known as double consciousness. It is to this integration and unification of the central meeting-place of all the streams of motion in the body, of the central telephone exchange, as it is called by a very ingenious writer, that the individual organism owes its individuality, and differs from the compound organism, the polyp, and the sponge.

Normally, this central region acts with complete oneness, and numerous and diverse as are the channels into which the motion emitted from it may be directed; confused and obscure, or rather gradual and ill-defined, as are the boundaries between it and the adjacent mechanisms, yet no considerable draught of motion is ever emitted from it in more than one direction at the same time. A mechanism once set in motion may, it is true, continue in activity by its own inherent motion, while the motion of the central tract is diverted from it and directed into another mechanism; and thus the musician while manipulating his instrument, the orator while uttering the predetermined conclusion of his sentence, the seamstress while sewing her seam, can divert the attention to other things; but no one can attend to two different things at the same time. If a copious draught of motion is being emitted in any one direction, the very fact

of its emission excludes the possibility of any other draught being simultaneously emitted in any other direction. If a draught is to be directed elsewhere, it must be as an alternative, not as an addition to that already flowing. Attention may oscillate or alternate between two directions, but the direction of it to one thing *ipso facto* excludes it from every other.

Attention may be ordinarily transferred with readiness from one direction to another, but the readiness with which this transfer takes place varies in different individuals, and in all diminishes with advancing age. In certain cases, and in certain people, the transfer is effected with difficulty. The more copious the stream of motion that is flowing in one direction, the more intensely the Attention is spontaneously engaged upon a given object, the less is this stream of motion, the less is this spontaneous Attention, liable to be diverted by incoming impressions. When the mind is lying fallow, when we are listless and inattentive, without being fatigued, every trifling impression secures a momentary direction of attention to it; but the more earnestly our Attention is engaged upon any single object, the more loudly may incoming impressions knock at the door of sense without being attended to. The mathematician or the chessplayer who is fascinated by his problem, the reader who is immersed in his book, the writer who is absorbed in his composition, may hear, indeed, the sound of some intrusive voice, but they will not catch the sense of what is said. Their attention is too closely rivetted to the one object to permit of its deviation to the other.

Such a state of things as has been described is, of course, wholly within the normal; but a more exaggerated degree of the same condition sometimes arises, and transcends the normal. In the condition known as melancholia attonita the whole attention of the patient is engrossed in some horrible foreboding or frightful imagination, and so complete is the absorption of the spontaneous Attention upon this one theme, that ordinary impressions are insufficient to arouse any reflex Attention at all, and even very intense impressions may fail to divert the Attention. The patient may be not only spoken to, but shouted at; not only touched, but shaken; without any sign of attention to the impression being evoked.

Since Attention can be concentrated upon one thing only at one time, it necessarily follows that the several forms of attention, as well as several instances of attention, are antagonistic and mutually exclusive.

Not only may extreme absorption of the spontaneous Attention exclude the direction of attention to arriving impressions, but the intrusion of arriving impressions is extremely apt to interfere with the continuity of spontaneous attention. This liability to interference with spontaneous by reflex attention varies very much in degree in different individuals. Some there are, who can abstract themselves from sense impressions, and devote their attention to continuous trains of thought, in the most distracting circumstances, like Archimedes at the siege of Syracuse. Others, like Mr. Babbage, are extremely liable to have their voluntary attention distracted by the intrusion of such a sense impression as the noise of a street organ; and there are others again whose meditations are perpetually distracted, not only by the powerful solicitation of arriving impressions of sense, but by the much less urgent solicitation of wandering currents of motion in the highest nerve regions themselves, evoked perhaps by the radiation of that very stream of motion which is the basis of the attention given to the primary object of it. The Attention of such people is at the mercy, not only of every chance sense-impression fortuitously arriving, but of every intrusive thought, the by-product of their own mental activity. The attention, instead of proceeding continuously in one specific direction, is perpetually diverted, now to this side, now to that, every phase of mental activity that is aroused in faint or nascent degree, whether by irradiation from the central stream, or by arriving sense-impressions, proving strong enough to evoke a reflex, and to divert attention from the main object of its pursuit.

Still, in the normal, in spite of constantly repeated diversions, the attention does return again and again to the main object of its pursuit, and such persons are capable of maintaining their spontaneous Attention upon one object, although its maintenance is subject to repeated interruptions of longer or shorter duration. There are morbid states, however, in which even an intermittent maintenance of attention is impossible. In acute delirious mania, and in other forms of insanity, we witness a continual flow of words, with each of which we must suppose that some more or less distinct mental state is connected, but in which we can trace no continuity at all of attention. The words are sometimes combined into sentences, and in that case the sentences have no coherence with one another, do not refer to the same subject-matter, exhibit no continuity of attention from one to another; but often there is not sufficient continuity of attention even to allow of

the complete formation of a sentence, and what is uttered is a stream of incoherent words, a continuous senseless babble.

A less degree of vagrancy of attention is witnessed in other morbid states. Normally, the length of time during which the attention is directed to any one topic, bears some relation to the importance of that topic to the welfare of the organism. The distant approach of a railway train will attract but a momentary attention so long as we do not propose to travel by it, but if we have decided to make a journey by its means, the attention devoted to it will be more protracted. The terms and the bearing of a new law will attract but a transitory attention if our own welfare is not likely to be affected by it, but if it affects our means of livelihood, it will be attended to with great solicitude. A marked peculiarity of certain disorders of mind is the vagrancy of attention even upon matters which closely concern the welfare of the individual. In general paralysis of the insane, the mind is often occupied with a number of projects, each of which is of the greatest importance to the individual. A man will project a great addition to his house; an important innovation in his business; the establishment of a lucrative patent; the acquisition of a title; and other endeavours, any one of which would engage the attention of a normal person for several hours of the day; any one of which would colour the whole meditations so long as it was entertained; any one of which would attract repeated recurrence of the attention whenever it had been temporarily diverted by some topic of more immediate urgency. To this underlying topic the attention would always gravitate after every temporary swing in some other direction. But the general paralytic is not so influenced by his important project. He has determined that he will make a vast fortune by sheathing ships with indiarubber so as to abolish the danger of collisions at sea; but while he is discussing this important project, his attention may be diverted to a spot of dirt upon his shirt cuff, and from this he will pass to expatiate on the iniquity of his laundress, then to the comparative merits of different soaps, to the relative effectiveness of different modes of advertising, to the merits of his favourite newspaper, to the prospect of this or that horse winning the Derby, and in the meantime his important project, by which his fortune is to be made, is entirely cleared out of his mind. His Attention does not spontaneously revert to it, but has to be recalled by external suggestion, and when it is recalled, it is not applied with the intensity which so

important a project justifies, and is again at the mercy of any fortuitous solicitation either from without or from within.

Attention may therefore suffer various modes of disorder. It may be generally deficient; or spontaneous attention may unduly preponderate over reflex attention; or reflex attention may unduly interfere with spontaneous attention; and in any case the degree of the disorder may be within or without the limits of the normal.

DISORDER OF EFFORT

Disorder of the consciousness of Effort is not often conspicuous, being often marked by the greater prominence of some accompanying disorder of mind, but it is by no means infrequent.

Effort may be abnormally defective. It is clear that the exaggerated estimate of the patient's own capacity and powers, which is so characteristic of the classical form of general paralysis, must be accompanied by, even if it do not rest upon, a deficiency of Effort. If a man is unable to appreciate the impossibility of jumping over a house, the inability must in the last resort imply an inability to represent the Effort involved in such a feat. If Effort is not represented, it is that the relation between activity and resistance to activity is not duly represented,—it is that, in this relation, the representation of activity preponderates unduly over the representation of resistance,—it is that the representation of activity is excessive, or the representation of resistance is defective, or both. Consideration of the physical state of the general paralytic leaves us in little doubt that the conditions for one at least of these disorders is present. Nothing is more characteristic of that form of general paralysis in which delusions of this class are prominent than the eager and incessant activity, the intense, if wandering attention of its victims; and, combined with this activity, is often a spendid physical "condition," as this term is understood by the athlete. As the one of these factors indicates abounding outflow of motion from the central reservoir in the nervous system, so the other points to a diminution in some, at any rate, of the modes of resistance to the outflow of that motion. What disorder there is of the consciousness of Effort,—and the disorder is often very conspicuous—is therefore a disorder in the adjustment of the Effort to the circumstances in which it occurs. In this as in other cases, the

state of consciousness faithfully reflects the action of the nervous system which it accompanies.

The normal variations of Effort have already been discussed. Effort is least when the store of free motion is most abundant, and, as this store becomes exhausted, so does the intensity of Effort increase. Hence, in abnormal states, in which the central store of motion is deficient, we expect to find, and we do find, an abnormal increase of Effort. In the great majority of states of mental depression, no exertion of any kind can be undertaken except at the cost of Effort much in excess of what would be felt in the normal state. In many such cases there is clear evidence, in the accompanying diminution of all forms of bodily activity, both molar and molecular, that the amount of motion emitted from the highest region of the nervous system, and indeed from the nervous system generally, is below normal, often much below normal. When we find that general muscular activity is diminished; that all forms of conduct are defective; that mental activity is defective; that attention is inactive; that secretions are diminished; that the movements of the intestines are sluggish; that metabolism generally is inactive; we have abundant evidence that the general store of motion in the organism is unduly deplete; and we have no hesitation in ascribing the increase of effort that then attends exertion of any kind to the depletion of the central store of motion, which alters the relation of activity to resistance. Whether resistance also is increased, we cannot say, but the diminution of the one factor is quite enough to account for the alteration of the relation between activity and resistance, and so for the increase in the consciousness of Effort.

An occasion in which Effort is excessive is familiar in the experience of most of us under the name of nightmare. In nightmare we are in some position of danger from which we struggle with the utmost strenuousness to escape; but our limbs seem as heavy as lead, and even with the most violent exertion, with an extreme consciousness of Effort, we are able to move them only with great deliberation. Or we see someone else in imminent peril, and we desire to call out and warn him of his danger; but even with utmost exertion, with extreme Effort, we are scarcely able to speak above a whisper. In such cases Effort is greatly in excess of what would normally be experienced during the production of the acts in question; but there is no reason to doubt that it faithfully represents the relation of activity to resistance in the nervous system under which it occurs. We must suppose

that in such cases the ablation of function which accompanies sleep has left some superior region unaffected and in possession of its activity, while it has deprived of its function some inferior region through which the activity of the first finds exit. The activity of the superior region is accompanied by the dreaming consciousness; the ablation of the inferior has raised the resistance of the channel of exit to a degree out of proportion to the volume and intensity of the outflowing motion which is seeking egress in that direction; and this alteration of the relation of resistance to activity is reflected in consciousness in the increased sense of Effort. In normal sleep, the suspension of function of the nerve regions is most complete in the highest regions, and diminishes downward. What constitutes the abnormity of nightmare is the retention of function of some superior region in excess of a subordinate region, so that motion is emitted which finds its egress obstructed.

There are certain cases in which the conditions, that obtain temporarily during nightmare, appear to be in part reproduced, and to endure for a much longer time. In many cases of mental depression the mind is acute and alert; the Attention is concentrated with normal, it may be with more than normal intensity; the secretions are undiminished; the functions of the digestive tract are unimpaired; the general metabolism is not inactive; and yet the sense of Effort upon exertion is greatly augmented. Mental exertion of various kinds can be undertaken without difficulty and without undue Effort, but bodily exertion is attended with a volume and intensity of Effort altogether out of proportion to the exertion undertaken. We may see a strong, muscular, healthy-looking man in the prime of life, who on being urged to walk, drags himself laboriously along for a few hundred yards, sweating profusely and haggard with the exertion, and at length flings himself down by the roadside, utterly exhausted by a walk of a quarter of a mile. Such an experience recalls vividly to mind the experience of nightmare. There is the same alertness of mind, and even exaggerated intensity of attention; the same cast of gloom and horror and sense of impending calamity in the realm of feeling; the same difficulty, laboriousness and extreme Effort in muscular exertion; and even the same sweating in the trifling and ineffectual muscular action that is achieved. It seems fair to assimilate such cases to cases of nightmare, and to suppose that the nervous disorders that underlie states so similar are not widely different. It seems fair to suppose

that in these cases also, the nervous defect is not so much or not entirely a defect in the rate of accumulation of motion, but that there is an obstruction, at some comparatively low level, to the egress of motion that has accumulated above. Moreover, the resemblance of such cases to nightmare is maintained in their course. When they recover, as they usually do, they recover rapidly like one awakening from a dream, and they look back upon their morbid state with the same wonderment.

DISORDERS OF INSTINCTIVE DETERMINATION

The anomalies of Instinct constitute one of the most interesting of all the departments of mental science. Their interest arises not only from the fact, already noted, that Instincts form, if not the ultimate motive, at least the penultimate motive, of conduct, and are the ultimate determinants of the direction of conduct; but even more from the extraordinary character of some of the anomalies themselves, and from the extreme difficulty, in the present state of our knowledge, of accounting for them or bringing them into correlation with other orders of phenomena.

Since Instincts can be studied only as they manifest themselves in conduct, this branch of our inquiry trenches upon and blends with the study of conduct itself, which will form the subject of a subsequent volume. Here it can be treated in general only, and in what is said here the subsequent volume must be to some extent anticipated.

In the same individual are many instincts in various stages of development, and the acts to which these several instincts prompt are often inconsistent with each other. The primordial instincts of Reproduction and of Sustenance are universal, but even they are far from being of equal intensity in all individuals. The more recently acquired social instincts, ancient as is their origin, and long as they have been transmitted from generation to generation, are in many individuals far below, in others far above, the average in degree of development. While generally, the strength of an instinct has a general relation to its antiquity, yet, as we have already seen, the relation is by no means precise, and instances are common enough in which a more lately acquired instinct, that of maternal affection for instance, can overcome the more primordial instinct of self-preserva-

tion. A very startling fact in connection with instinct is that even the most fundamental of all, the Reproductive Instinct, may be congenitally absent, as in cretins; a still more startling fact is that this primordial instinct can be artificially abolished, and this not by removing a tract of nerve tissue in which it may be supposed to be embodied, but by excising the testes or the ovaries, which are altogether outside the nervous system. Lastly, the most startling fact in the whole range of mental science is that Instincts, even those of extreme antiquity, even those which, next to the Reproductive Instinct, are the most ancient and primordial and fundamentally important of all, may undergo actual reversal and be replaced by their opposite. The Instinct of self-preservation may be reversed and replaced by a furious craving for self-destruction; the instinct of maternity, that natural στοργη, may be reversed and replaced by a fury of destructiveness directed against the helpless offspring.

In dealing with phenomena of such varied character, some arrangement is necessary, and it will be convenient to consider the anomalies of Instinct under the heads of Defect, Disproportion, Excess, and Reversal.

Defect of instinct is a very relative term. As already stated, instincts, even the most primordial, vary greatly in intensity within the normal in different individuals. The sexual instinct is on the whole much less intense in women than in men; so that what would be defect in a man would not be defect in a woman, and in each sex varies very widely. In both women and men it varies enormously at different times of life, so that what might be regarded as defect at one time of life would not be defect at another. Moreover, its natural manifestations are to so large an extent neutralised by the more lately acquired instinct of Modesty, that it is exceedingly difficult to judge to what extent it exists in any given case. With other instincts the estimation is easier. As every adherent of the doctrine of Evolution would expect, those instincts are most often defective which are still in course of acquisition, and the antiquity of an instinct is, upon the whole, in inverse relation to the frequency and the degree of its defectiveness. The more recently acquired social instincts, the instincts of Honesty for instance, and Justice, and Industry, are most frequently and most conspicuously defective; the older social instincts of sexual Modesty, and Sympathy with suffering, are less often and less conspicuously to seek; the intermediate instincts of affection for

the young offspring, and Accumulation, still less often and less conspicuously; and the primordial instincts of Sustenance and Reproduction are least of all liable to defect.

Defect of an instinct may be part of a general defect extending to all the coeval powers of mind, or may be a particular defect confined solely or mainly to the instinct in question, and leaving unimpaired the other powers of similar standing. In idiocy and imbecility there is a defect in all the powers of mind that are late in the order of acquisition, the later-appearing instincts among them; but there are many persons whose powers of Thinking and Willing are quite up to the average, but in whom such instincts as Honesty and Justice appear to be completely absent; of such persons the criminal classes are composed.

Instincts of all grades are liable to be excessive, and excess, like defect, is very largely relative. As the instincts of most recent origin are most liable to defect, so those of greatest antiquity are most prone to be excessive. Of all instincts, the Sexual, which is the most primordial, is the one most often present in excess, that is to say, the one which is most prone to absorb an unduly large proportion of the free motion of the organism. Seeing that the amount of motion at the service of the organism is limited in quantity, it is manifest that any excess which is expended in any one direction must be balanced by defects in other directions; and that this excess is in all cases accompanied by defect, though defect is not necessarily accompanied by excess, since the total free motion of the organism may be defective. The excess may be a consequence of the defect; that is to say, the superior instincts, or those of later origin, may never be developed at all, and the free motion of the organism may have no mode of egress except through the primordial instinct-mechanism. It is in this way that the well-nigh constant masturbation of so many imbeciles may be accounted for. In other cases, the excessive propensity to activity of an instinct appears to be due more to the overdevelopment of that particular mechanism than to the lack of development in others, as in the excessive indulgence in Accumulation that is witnessed in such misers as John Elwes and Daniel Dancer.

As the circumstances of mankind have profoundly altered in the course of the ages which have elapsed since he reached the status of humanity, instincts, which were appropriate and necessary in circumstances formerly existing, have become inappropriate and detrimental

in the circumstances that exist now; and the presence in a high degree of such archaic instincts is now excess. Among such instincts are the Predatory, the Combative, and the Vagrant, all of which were of high importance to man in a more primitive stage of development, but which have now become obsolete, and appropriate in small degree and in modified form only, to employ whatever surplus of activity remains to be devoted to recreative purposes after the serious needs of life have been satisfied. In cases in which a large amount of activity remains unexpended after the satisfaction of these serious needs, it is not uncommon for a very large share of the total activity of the organism to be devoted to the satisfaction of these obsolete instincts, and thus are formed the characters of the sportsman, the soldier of fortune, and the explorer.

Reversal of instinct is not very uncommon in the sense that an individual is possessed by a strong, it may be a furious, craving to act in a manner precisely the reverse of that which would be immotived by one of the fundamental instincts; as in the cases, already cited, of self-destruction and of the destruction of young offspring. Although, however, we have called these acts reversals of instinct, this is but a loose and inaccurate mode of describing them. It is true that the acts are the reverse of acts that are prompted by instincts of very ancient origin, but these acts must and do depend upon motives—upon desires—upon instincts; and what we are compelled to infer from the occurrence of the acts, is not the existence of a reversing gear in the constitution of an instinct-mechanism, but the existence of other instincts prompting to acts antagonistic to those which are "reversed"; instincts which may, and do under certain circumstances, become dominant, and completely overpower those which are commonly their masters. It will be noted that what is here contended is not that there are opposing pairs of instincts, an instinct of self-preservation and an instinct of self-destruction; an instinct of cherishing offspring and an instinct of destroying offspring; but that different instincts may prompt to acts of opposite characters. Thus, the instinct of accumulation prompts us to save, and the instinctive desire to stand well with our fellows, and to impress them favourably, prompts us to spend; and the acts of saving and spending are antagonistic; but the instincts of accumulation and of social ambition are not antagonistic. To identify the particular instincts which prompt to the acts of self-destruction and of infanticide does

not come within the scope of the present work, which deals with general principles only. The more detailed task will be undertaken in the examination of Conduct which follows.

The reversal of instinct, as well as the disproportion of instincts, may therefore be resolved into excess, or defect, or a combination of excess in one direction with defect in another. There is, however, another disorder of instinct which can scarcely be so resolved. This is perversion of instinct. The most notable instances of perversion of instinct are presented by the Sexual instinct, and the perverted forms of this instinct have been studied and described with a minute particularity which does not seem to be at all necessary for the purposes of science; but the sexual is not the only instinct which is liable to perversion. By perversion of an instinct is meant that the instinctive desire prompts its possessor to acts that are manifestly not calculated to supply the need under whose urgency the instinct came into existence. The sexual instinct has become fixed in the race of living beings under the urgency of the need of continuing the race. Other things being equal, those beings in whom it was strongest would have left most offspring, and thus, under the influence of natural selection, it has been developed to the pitch at which we find it. When the sexual instinct prompts to acts that are manifestly in no degree, either directly or indirectly, conducive to the production of offspring, it may be said to be perverted; as when it prompts to quasi-sexual proceedings towards members of the same sex. Similarly, when the instinct of self-sustenance prompts to the act of eating clay and other innutritious substances, which do not, directly or indirectly, serve the purpose of self-sustenance, the instinct may be said to be perverted. So the combative instinct is perverted when it prompts the Malay to run amok; for the conduct so denominated tends to the benefit neither of the individual nor of the community to which he belongs. So the Accumulative instinct is perverted when it prompts to the accumulation of masses of useless rubbish. So the instinct of Courtship is perverted when it prompts to deformation of the figure by a constriction of the waist which does not attract, but repels the other sex. So the instinct of social ambition is perverted when it leads to the assumption of a costume, or to phases of conduct, which manifestly do not enhance, but diminish, the respect in which the actor is held by his fellows, as often happens to the buffoon and other notoriety seekers.

It is in cases of perversion that the quasi-parasitism, attributed to instinct on a previous page, becomes most conspicuous. It is common for the possessor of one of these distorted mechanisms to loathe the acts to which his perverted instinct prompts him. His other instincts cry aloud against their performance, and the moment they are complete, the instinct-mechanism which actuates them depleted of its motion, and the desire at an end, the now unantagonised superior instincts assert themselves, and the mental attitude toward the lately completed act is one of horror and repulsion; but as the distorted mechanism refills with motion, so does desire return, increase in intensity, and culminate once more in an act, which is no sooner complete than it is abhorred.

The question of the origin of perversions of instinct must stand over until the origin of other variations in inherited qualities is determined. No individual exactly resembles its parents in any quality. Variation in some degree, however trifling, is the invariable rule. There is nothing more surprising, or more needing explanation, in the appearance of useless or of detrimental variations than in the appearance of useful variations. New forms of animal life have again and again arisen in consequence of the occurrence of variations of instinct prompting to the trial of new kinds of food. Under the prompting of such variations of instinct, a race of mammals has become wholly aquatic, another has become wholly aerial; under the prompting of such variations of instinct, one race of insects has taken to a diet of wood, another to a diet of nectar, another to a diet of dung. For each of these variations of instinctive preference for food, which has become established, and resulted in the formation of a race specially adapted to subsist upon that kind of food, how many variations have been barren, and have brought to their possessors an early and childless death? There does not seem to be anything more to be explained in the variation of sarcophagy and phytophagy into geophagy, than in the variation of therophagy into ichthyophagy. The perversion of an instinct is a spontaneous variation. It is an unsuccessful experiment, a variation that is doomed to failure and extinction; but variations of this class need explanation no more and no less than do profitable variations. In one man a modification of mechanism appears, the activity of which is manifested in a desire to exertion in the direction of producing harmonious sounds; in another a modification of mechanism appears, the activity of which

is manifested in a desire to collect postage stamps or to eat clay; and whatever influences are able to produce the one variation are sufficient, *mutatis mutandis*, to produce the other.

DISORDER OF ACQUIRED DETERMINATION

Acquired mechanisms, like inherited mechanisms, are liable to be defective or excessive, and are moreover subject to a third disorder which is in some degree analogous to the perversion of instinct.

Defect of Determination exhibits itself in two ways: there may be delay or difficulty in the formation of the mechanism, or the mechanism, when formed, may be wanting in persistence.

An acquired mechanism is formed during the process of Willing. The process may have to be repeated many times in the course of the formation of the mechanism, but it is under the influence of choice, in the way already described, that the mechanism is formed. There is a nascent activity of a plurality of mechanisms, and, by the addition of motion from the central store, one of these mechanisms gains the preponderance and becomes actual; and the connection, the structural communication, thus formed between the structural memory of the circumstances and the mechanism or structural memory of the action by which the circumstances were dealt with, unites these two structures into a new mechanism. Defect in this process may exist either in the formation of the communication, or in the persistence of the communication when formed.

The period of alternate nascent activity of different mechanisms is the period of Hesitation or Deliberation, and this period is subject to normal differences of duration which may be exaggerated into the abnormal. The normal determinants of the period of Hesitation are as follows:—

1. The number of alternate activities. It is evident that the duration of the period, during which a plurality of mechanisms are taking on alternately a paulo-plus nascent activity, must be greater, *cæteris paribus*, according to the number of the mechanisms concerned in the struggle. The process in each mechanism occupies a time which, if brief, is appreciable; and the total period of Hesitation is the sum of the periods of commencing activity in all the mechanisms; so that, the more numerous the mechanisms, the longer the time of Hestitation. The alternatives are not present in the mind

simultaneously, but in succession; and the length of the succession must be greater, the greater the number of succeeding events. For this reason it is that men of wide experience and richly stored minds are longer in coming to a conclusion,—in determining upon a course of action,—than are the inexperienced and the ignorant.

2. The complexity of the circumstances. If I meet a wide cart in a narrow lane, the side on which there is most room is immediately obvious, and these simple circumstances arouse without hesitation their appropriate activity. But if I am asked to join a Committee for the furtherance of a certain project, I have to consider, first, whether the project itself is a desirable one; second, whether it is likely to be furthered by the labours of a Committee; third, whether the particular Committee proposed is likely to further it; fourth, whether my adhesion to the Committee is more likely to help or to hinder their labours; and fifth, whether the project is of such relative importance as to justify the devotion to it of time which would otherwise be given to other projects. The consideration of all these circumstances must of necessity occupy more time, must necessitate a longer period of hesitation, than the consideration of whether there is more room on the off-side of the cart than on the near side.

3. The familiarity or novelty of the circumstances which have to be dealt with affects very materially the duration of the period of hesitation. The more nearly these circumstances resemble circumstances that are familiar, that have been often dealt with, and the more often such similar circumstances have been dealt with, the more completely organised is the mechanism appropriate for dealing with them, the readier is its reaction, and the shorter is the period of hesitation that intervenes between the impress of the circumstances and the initiation of the activity for dealing with them.

4. One of the most potent factors in prolonging the period of hesitation is the importance to the welfare of the organism of the decision in which this period is to end. Whether to choose the cigar or the cigarette that is offered to him, a man may hesitate for a second; whether to take a cab or to go by train toward his destination, he may hesitate for a dozen seconds; whether to transact a piece of business by writing a letter or by going to see his correspondent, he may deliberate for five minutes; whether or no to rent a particular house for a term of years, he may deliberate for a week or two; whether to enter into partnership with a particular firm, or to throw

up his profession and take to another, may properly be deliberated for a month or two before a decision is taken. But to hesitate for ten or fifteen seconds as to whether to choose a cigar or a cigarette; or for five minutes whether to take a cab or a train; or for a week whether to communicate in writing or by personal interview; would clearly be an excessive prolongation of the period of hesitation, and would be excessive because out of proportion to the importance of the decision to the welfare of the hesitator.

5. Lastly, the duration of hesitation will depend largely upon the general vigour and repletion with motion of the nervous system. When the general level of tension is low; when the amount of motion accumulated in the central store is small, there will be little tendency for this free motion to flow out and reinforce, so as to produce a preponderance of activity in, any nascently active mechanism. Under such circumstances, nascent activities may arise and subside in frequent alternation for a length of time before any one of them passes beyond the potential stage and becomes potent. But where the general level of tension is high; where the amount of free motion is great; where the contained motion is pressing against its boundaries and struggling to escape; there the pouring out of motion will readily take place, and there the nascence of even an approximately appropriate activity will suffice to evoke such an outpouring; and, in such circumstances, the choice may fall upon a mode of activity less appropriate than might have been selected, had a longer period of hesitation given opportunity for the representation of a larger number of more varied activities.

From a consideration of the several factors enumerated, we shall expect to find, and experience shows that we do find, that the most hesitating people are those who, with wide experience and well-stored minds, are lacking in energy of conduct; and that the occasions of longest hesitation are those in which novel and complex circumstances of great importance to the welfare of the individual may be dealt with in a large variety of ways; while on the other hand, the persons who hesitate least are the vigorous, active, energetic persons, of narrow mind and limited experience, and the occasions in which decision is most rapidly attained are those in which simple and familiar experiences suggest a minimum of alternative courses of action. For both reasons we might expect to find, as we do in fact find, that hesitation increases, on the whole, as life advances. The acquisition

of experience, which increases the number of competing mechanisms, is accompanied by a diminution in the amount of free motion, which, even if the number of competing mechanisms were the same, would retard the process of choice amongst them. These influences are, it is true, partly counteracted by the increased familiarity with different circumstances, and by increased facility in classifying the components of complex circumstances; factors which in very many cases outweigh the retarding influences, and render decision more rapid in mature age than in youth; but, *cæteris paribus*, the decisions of youth will be more rapidly taken, and more often wrong.

There are certain morbid states in which the period of hesitation is unduly prolonged, and of these there are two varieties; one in which the period is prolonged simply, and one in which the moment of decision is postponed by the interposition of other activities, foreign to the purpose, between the decision and the effectual action. Simple prolongation of hesitation is much rarer than the other form, but is sometimes met with. A lady will spend twenty minutes in front of an open drawer, unable to decide whether to take out the brown gloves or the black ones; or will sit for a quarter of an hour with a stocking in her hand, unable to decide whether to put it on the right leg or the left. In such cases is reproduced in actual fact the imaginary dilemma of Buridanus his ass. The second variety of morbid prolongation of hesitation will be best dealt with after we have considered the excesses of Determination.

The second defect of which a mechanism is susceptible is in, not the process of its formation, but its persistence when formed. Normally, a course of conduct once decided upon is adhered to and carried out to the exclusion of its quondam rivals. An activity that once gains preponderance maintains the preponderance so long as the circumstances under which it was chosen remain unaltered. It may, of course, happen that lapse of time, or the course of conduct itself, may disclose circumstances which render the mode of action inappropriate; and in this new situation a new decision is called for. If, in these new circumstances, the inappropriate activity is still adhered to, the course of conduct and the attitude of mind that prompts it are abnormal, and are variously characterised, as will presently be shown; but if no new circumstances arise, the original mode of activity should continue until these circumstances are disposed of. When, in circumstances that are not materially changed, the course of conduct

fluctuates, one mode of action after another being adopted without any clear indication that the modes are inappropriate, then the term vacillation is applied, both to the course of conduct and to the mental condition behind it. The difference between Vacillation and Hesitation is manifest. Hesitation is the period of inactivity during which the struggle amongst the nascent activities of different mechanisms is proceeding, during which the nascent activities of the mechanisms is alternating. Vacillation is the alternation of actual activities begun, relinquished, and superseded. Vacillation is a hesitation of greater degree, of graver import, occurring at a later stage; it is hesitation among activities that are actual instead of among activities that are merely nascent. The lady who hesitated as to which leg she should first clothe in her stocking was, during the period of hesitation, passive, and did nothing. When, at a later stage of her malady, she actually began to put one foot into the stocking and then withdrew it to introduce the other, her hesitation had become vacillation. The important difference between hesitation and vacillation is that, while a certain amount of hesitation is normal, vacillation is never normal, even in the least degree. Under circumstances already considered, the claims of several courses of conduct to the position of greatest appropriateness may be nearly equal, and may warrant a prolonged period of hesitation; but the choice once made, the preponderance once gained by any one form of activity, hesitation should be at an end; and the determination to pursue that course of conduct should remain unchanged as long as the circumstances remain the same.

Tenacious adherence to any form of activity that has once been decided upon is of immense importance to welfare, and is not only normal, but essential to survival. So long as the circumstances remain unchanged, and the activity is not found on trial to be inappropriate, its predominance can scarcely be too absolute. In laying down this law, regard must be had to temporary inappropriateness of circumstances. A man determines to execute a piece of work, and starts upon it. It is no vacillation if he lays his work aside for a time for the purpose of eating, or sleeping, or for other temporary employments which are incompatible for the time being with the prosecution of the work. There is no vacillation so long as he returns to the work whenever the circumstances again become appropriate, that is to say, when the more immediate and more urgent need is satisfied. Vacillation begins only when the persistence in the line of conduct

is postponed to the satisfaction of a need less immediate and less urgent.

As has been stated, vacillation is never quite normal; but it will be seen that it is often difficult to say what postponement or intermission of activity amounts to vacillation. In practice, however, little difficulty is experienced in deciding in any given case whether the variation of conduct amounts to vacillation or no, and whenever it is present it is abnormal. The most striking and conspicuous examples of vacillation are, as might be expected, found in the conduct of insane persons, and sometimes the vacillation is one of the most conspicuous features of the malady. This is the case especially in some case of general paralysis. Patients suffering from this form of insanity often appear incapable for any length of time of continuing in one stay. They shift from one project to another with such startling rapidity, that in the course of half an hour they will determine on the immediate pursuit of a dozen projects, any one of which would be beyond their capacity, and no two of which would be compatible with one another.

Excess in Determination, like defect, may exhibit itself either in the process of forming the determination or in the state of the resulting mechanism. As the period of Hesitation may be unduly prolonged, so may it be unduly abbreviated. In those in whom the amount of free motion, available for the reinforcement and actualising of a nascent activity, is large, and in whom the habit of hesitation has not been cultivated, the reinforcement and actualising of a nascent activity is apt to take place prematurely, before all the modes of action, possibly appropriate to the circumstances, have been passed in review. This prematurity of decision, when it results in immediate action, is called precipitancy and by other titles, and when it does not result in immediate action, but merely in the formation of a mechanism—merely in the establishing of a communication between two areas of nerve tissue whose activity is recognised to be similar—then the immediate result of the volition is confined to the formation of a connection between states of consciousness, and the process is called jumping to a conclusion. As might be expected from the conditions under which it occurs, precipitancy in conduct, and jumping to a conclusion in thought, are peculiarly apt to occur in the young, in whom the store of free motion is copious, and the conditions for hesitation are undeveloped.

Once formed, a mechanism may continue in activity after the circumstances have ceased to be appropriate to the special mode of conduct which the mechanism embodies. This excess in the persistency of a mechanism may be exhibited in circumstances that are either temporarily or permanently inappropriate to its continuance. The first of these conditions is not common. It is not common for a line of conduct to be adhered to, to the neglect of more urgent needs, and the reason is clear. In the biological history of our race, the urgency of our needs has come to be pretty faithfully reflected in the urgency of our appetites, and the satisfaction of the primary appetites has become a primary motive of the strongest kind, which intrudes upon, and easily supersedes, courses of action undertaken after deliberation—courses of action that, although ultimately prompted by primary appetites, are proximately prompted by motives less urgent. Occasionally we witness the domination of some enthusiasm which triumphs over even the primary appetites; we see a course of study, or of business, or of recreation, or it may be of prayer, persisted in to the neglect of food and at the expense of sleep; but such excess in the persistence of action of a mechanism is much less common than is its persistence in the face of circumstances that are more permanently inappropriate.

Excess in the persistency of action of a mechanism in circumstances that have become inappropriate, or defect in the flexibility and adaptability of conduct, is one of the commonest and one of the most important of the errors to which conduct is liable. As it is displayed only in conduct, it will be considered more appropriately and at greater length in the consideration of conduct. A familiar instance is presented by servants when they keep up in the mild and even warm weather of advancing spring, the large fires which were appropriate to the cold of mid-winter; and other instances will be given in the examination of conduct.

The most severe, and happily the rarest, of the excesses in the action of acquired mechanisms, is presented by those cases in which such mechanisms become the seat of the accumulation of large quantities of stored motion, and take on, it may be in exaggerated form, the character of parasitism that is normally inherent in instinct-mechanisms only. When such parasitic mechanisms are formed, it often appears that not only their excessive spontaneity, but even their original formation, is acquired independently of the activity of the

supreme nerve region, and therefore of the Will. They come into being, grow, and attain fixity and spontaneity, much as does a cancer or other morbid growth, independently, and in defiance of the needs of the organism, in whose midst and at whose expense they are formed. In them exists a store of motion, outside and independent of the central store from which the normal spontaneous acts of the individual originate; and this parasitic mechanism may, and often does, attain to a degree of power which enables its activity to take precedence of, and to supersede and overpower the activity of mechanisms directly actuated by the motion of the central store. Whatever inhibitory arrangement exists between that store and other mechanisms, is wanting in this case; and the activity of the parasitic mechanism is able to prevail against, or to supersede and replace, the normal Will, or the activity of the central unmechanised region of nerve tissue. It is to the existence of such a parasitic mechanism as has been described, that is due the occurrence of what are known as obsessions, a term adapted from the mediæval writers upon diabolical influence, but used in a sense much more congruous with their use of the term possession. Obsession was used by them to characterise the besetment and assaults of the devil from without; possession to characterise his entrance into, and capture of, the citadel of human volition, and his subsequent use of this position to enforce the doing of acts foreign to the disposition of the acting individual. This latter is precisely the sense in which the term obsession is now used, with the difference that the possessing influence in now considered, not diabolical, but pathological.

Obsessions are extremely varied in character. When the mechanism is not, or is but little, motor in character, when it consists mainly in excessive and indivertible communication between nerve regions, it finds expression in unreasonable and indissoluble belief, and as such is considered under the head of disorder of belief. It is only when the parasitic mechanism is motor in character, and is maintained in undue repletion with motion, that it is an obsession as ordinarily understood, and it is this character alone which differentiates obsession from delusion. Both are fixed arrangements of nerve tissue unalterable by the influences which normally modify the arrangement of nerve tissue, but, while the substratum of delusion is the indissoluble connection between two areas, the substratum of obsession is the undue and persistent repletion with motion of an area.

Limiting the term to the latter and narrower sense, obsessions may occur among any class of mechanisms. Frequently they affect an articulatory mechanism, and in this, as in other cases, may exist in very various grades of intensity. A very common occurrence is the slightly exaggerated immotivation of an articulatory mechanism of normal formation, the result of whose slightly excessive action is that a form of words is represented, and repeatedly represented, in consciousness, out of relation with the other contents of consciousness at the time. This annoyance, of words, phrases, passages or verses "running in the head" is one to which all persons of moderately good verbal memory are subject at times when, with a good deal of general activity, there is little close engagement of the attention. A more pronounced degree of the same affection occurs when the words are not only represented in thought, but attain to actual utterance. Normally, the utterance can be inhibited without much difficulty, but where the immotivation of the mechanism is pathologically excessive, the inhibition is effected with great difficulty and much effort, or the mechanism may overpower the inhibitory mandate, and become actual in spite of effort. Dr. Hack Tuke describes the case of a gentleman "who was the last man in the world to use profane language, but who had the very greatest difficulty in preventing himself doing so in church, and sometimes while walking in the street, without the slightest cause of irritation. His wife was surprised to see him give a sudden jerk from time to time, and was not aware of the cause. He, however, told me that these spasmodic movements arose from his attempt to rid himself of his trouble, and avoid using bad language." In cases yet more pronounced, the words are actually uttered, to the pain and grief of the utterer. Another variety of the parasitic mechanism which is sometimes wholly, and always chiefly articulatory, is what is known as the counting mania. In one person every choice is delayed by a period of hesitation, which is occupied by the representation of activities which have no connection with the circumstances to be dealt with, but are the activities of counting merely. Before anything is decided on, or after the thing is decided on, before it can be done, the parasitic mechanism interposes its activity and the counting must be performed. "Imagine her now at the breakfast table," says Hack Tuke of one of his patients, "wishing to take up the teapot; a considerable time would elapse before she was able to seize the handle, the only means of accomplishing this feat being

the same wearisome process of counting, generally to ten, or multiples of ten. Suppose now she took a walk, she could not open the front door without counting. . . . She had no pleasure in looking at the shop windows or at pictures, for she had to count a certain number of times before her enemy allowed her to regard them." And it was the same with everything that she decided to do. Sometimes the counting, as in the instances given, is the mere repetition of numbers without reference to concrete things of which they are numbers; but often concrete things are counted. The same patient would count the number of times she breathed and the number of her steps. Napoleon Buonaparte is said to have had the habit of counting, two by two, the windows of the houses as he passed; and other people have been impelled to count anything numerable that happened to be present in their surroundings.

The mechanism may, however, be in the region of the prehensory or locomotor tract. The impulsion may be to touch things, and this also is a common form of the malady. Dr. Johnson's propensity to touch the posts in the street is well known, and Boswell has recorded how, if he missed one, he would go back and touch it. The propensity is common among the insane, though it is by no means confined to them. In connection with locomotor mechanisms the intrusion of parasitism is very common. There are probably few people who have not at one time or another exercised a wholly unnecessary and absurd choice as to whether they would step upon, or avoid stepping upon, the dividing lines between the paving stones in the street; and it is not uncommon for one of the feet to be a favourite, in such wise that in entering a door, or going upstairs, that foot must take the lead.

Other parasitic mechanisms are not confined to any one set of movements, but are of a more general character, and affect conduct as a whole; and, as in the cases already cited, these mechanisms may become active spontaneously, or may be more or less reflex in their character, requiring the provocation or stimulus of specific circumstances before they become active. One man finds that whenever he is in a place in which such an action is possible, he is strongly inclined to throw himself off the place on which he is standing on to a lower level, and the greater the difference in level, the stronger is his inclination. He has no desire to end his life; he is not giddy; but when he finds himself in such circumstances, there is set going a

mechanism which it requires a strong effort on his part to control. In such a case the mechanism is purely reflex. In other cases the provocation of circumstances is not required, or is but little required, to start the mechanism into activity. Under the normal process of anabolism the mechanism gradually fills with motion, and, when replete, it starts into an activity which has been preceded by a longer or shorter period of desire. The activity of the mechanism may vary very much in its degree of continuity, remission, or intermittence. Some of these parasitic mechanisms are well-nigh continuous in their action, though subject to remission from time to time; others are active at intervals only, and their activity may begin gradually and be preceded by a period of desire, or may break out with electric suddenness. Of the mechanisms whose action is so frequent as to be, for practical purposes, continuous, an example has already been given in the counting mania. Of those that are only intermittently active, but are gradual in the rise and decline of their activity, the rather rare cases of homicidal obsession furnish good examples. To a man or woman in whom the parental instinct is strong, and to whom their offspring are inexpressibly dear, the desire to murder these children presents itself, and is repelled with the utmost horror. In spite of the repulsion, it recurs again and again. It grows in intensity, until its victim cannot trust himself or herself in the sight of the children. He lays his pitiable condition before his doctor or his priest; he reveals it to his family; he even rushes off to give himself up to the police, or to the friendly protection of a lunatic asylum, and begs to be forcibly restrained from performing an act, which is inexpressibly horrible to him, but which he feels is gaining strength, and will at length get itself performed in spite of his resistance. The repletion of the mechanism, and the corresponding desire, are spontaneous and independent of provocative circumstances, but circumstances do nevertheless exert a powerful reflex influence contributory or antagonistic to the activity of the mechanism. If, as in the case supposed, the impulsion is toward the destruction of children, then the forcible separation from the children, though it may not diminish desire (as a fact it does usually diminish desire) yet prevents the mechanism from operating; and on the other hand the presence of the children, especially if accompanied by the presence of a knife or other lethal weapon, exerts a powerful reflex influence corroborative of the action of the mechanism.

Finally, there are mechanisms which become active intermittently, and whose activity breaks out suddenly and without warning, and the activity is usually destructive in its effects and often blindly destructive, and in that case may be selective or non-selective. That is to say, sometimes particular objects are selected for destruction, at others the destruction is not aimed at particular or selected objects, but is exercised generally upon anything that may come in the way. One person will always break windows; another will always tear clothing; in a third the impulse will be to the destruction of crockery; a fourth will attack persons generally, or certain classes of persons, as women or children, or particular individuals; while in a fifth the destructive impulse will be towards incendiarism, and in a sixth will be suicidal in character.

Upon a wide review of many cases of parasitic activities, it is apparent that the degree of the parasitism varies very much. In some, the impulsion to the act is violently antagonistic to the remainder of the disposition of the individual, and the whole force of the Will is engaged in the endeavour to combat and overcome the activity of the thoroughly parasitic mechanism. In others, the mechanism is on a higher plane, is much more identified with the self, obtains concurrence and reinforcement from the Will in various degrees, and sometimes in a high degree. In short, between instinct and habit on the one hand, and the most independent parasitism of activity on the other, there are infinite shades of gradation.

The periodical activity of mechanism is a very conspicuous feature in many cases of insanity. It is true that in such cases there does not usually appear to be any opposition between the activity of the mechanism and that of the rest of the mechanisms composing the individuality or disposition of the individual. Rather, the periodically active mechanism seems, during its activity, to absorb into itself the whole available motion of the organism, leaving the rest of the higher mechanisms empty, and their activity consequently in abeyance. So long as it is active, it constitutes the character, or the main portion of the character, of the individual. Here is a man of penurious habits, a man proud of his old family, who is most reserved and austere in his demeanour, a man who is "opposite with a kinsman, surly with servants," whose tongue tangs arguments of state, punctilious and precise in all his own conduct and in his requirements of others. Every two or three years this gentleman's conduct alters, and the

signal of its coming alteration is that he upsets his bath two or three mornings running. This occurs with great regularity at intervals stated, and is followed by a succession of acts always of the same character. The first thing he does is to buy pigeons and a dog. (In his normal state he would as soon buy ostriches and an elephant.) Then he becomes lavish with his money; familiar with his servants; frequents low company; drinks to excess; his hauteur and austerity dissolve into a boisterous hilariousness; and so he continues for a few weeks or months, and then resumes his normal habits. Now it is difficult to explain the repeated recurrence of precisely the same sets of such specialised activities as the overturning of the bath, the purchase of pigeons and of a dog, except by the supposition that these acts are due to the activity of a mechanism constituted *ad hoc*, any more than we can explain the repeated recurrence of precisely the same specialised activity of nidification, except upon the same hypothesis; and during his normal years we must suppose that these mechanisms exist as empty structural memories, which, so long as they remain empty of motion, do not betray their presence. At stated periods they fill up and become active, and not only do they fill, but the mechanisms, by which conduct is regulated in the normal interval, at the same time become empty. There is no evidence of any struggle between the two sets of mechanisms. The one set supersedes the other without difficulty and without conflict. It appears as if the free motion were just shunted out of one track into another. How, and under what influences, the shunting takes place, we do not know. As with so many operations in this extremely recondite region, we have scarcely any data to guide us. It may be that in the interval, during which the normal mechanisms are dominant, the lower mechanisms are gradually filling with motion, and thus gradually fitting themselves to assume the domination of conduct which they subsequently acquire. In this case we should expect that, in the later stages at any rate, desire would be experienced corresponding to the degree of repletion. But desire is not felt. We have, however, other evidence to show that desire is not always experienced during the filling of a mechanism with motion, even when the amount of motion accumulated is very great. This is particularly exemplified in epilepsy. A tract of nerve tissue gradually accumulates motion to such an extent that at length it bursts forth in sudden and tumultuous activity, and yet, even up to the moment of the seizure, no desire is felt. No

doubt in major epilepsy the centres in which the motion accumulates are, for the most part, of low rank, and neither their repletion nor their action is ever attended by direct consciousness; but this explanation will scarcely hold good for *petit mal*, in which the loss of consciousness is usually the first, and sometimes the only event. Even, however, if we suppose that the alternate activity of the several sets of mechanisms, underlying the alternation in the general character of conduct, is due to the gradual repletion of the one set and the drafting off to it, when it once becomes dominant, of motion that formerly flowed in another direction; even if this be admitted, much is left unexplained; but for explanation of these, as of so many other phenomena in the region of mental operations, we must wait for further discoveries in the mode of working of the nervous system.

Closely allied to the parasitic mechanisms which have been dealt with, often combined with them, and sometimes not easily distinguishable from them, are other spontaneous alterations of the structure of the superior nerve regions; alterations which differ from those already described in the fact only that they are purely statical in their nature; that is to say, they are not mechanisms, not stores of motion, but merely open paths by which motion flows readily from place to place. They are precisely similar to structural memories, except that they are formed spontaneously by the internal operation of the nervous system, and not by motion arriving from the impress of circumstances. The accompaniment of the formation of such communications between nervous tracts is the formation of association between mental states, and according to the permeability of the communication, that is to say, of the inevitability of the combination of action of the two nerve tracts, is the inevitability of the association of the mental states. But an inevitable or indissoluble association between mental states is a Certainty; and the degree of indissolubility, or the difficulty of dissolving the association between mental states, is the degree of Belief that we attach to the association of their counterparts in circumstances; so that, while the spontaneous formation of a mechanism is the nervous condition of a mode of conduct; and the assumption of a parasitic uncontrollability by such a mechanism is the nervous condition of an obsession; so the spontaneous formation of a path of association between two nerve tracts is the nervous condition of an original thought; and the assumption of an insuperable permeability by such a path of association is the nervous condition of an insuperable Belief.

When the Belief remains insuperable in spite of the contradictory evidence of experience, it is termed a Delusion. The proper place for the discussion of delusions is of course under disorders of Belief, and there they are discussed, but they are mentioned here in order to bring into view the relation of delusion to obsession, both of which depend upon spontaneous and insuperable alterations of nerve tissue, but the one being the formation of a path of communication along which motion passes, and from which motion is indivertible; while the other is the formation of a store of motion, together with paths of communication by which the stored motion finds egress in specific directions.

MEMORY

If an iron wire is fixed at one end, and a twisting couple is attached to the other, the wire is twisted. When the couple is removed, one of two things happens. In the first case, the wire springs back to its original form, and the twist is entirely obliterated. The torsion of the wire is then said to have been within the limit of its elasticity, and within that degree of torsion the wire is said to be perfectly elastic. In the second case, in which the couple is stronger, the wire is twisted further round, and when it is released, it springs back a certain portion only of the distance, and retains permanently a part of the twist. In this case the wire is said to be twisted beyond its elastic limit, and the twist that it retains is called its "permanent set." The permanent set left in a body by the transient incidence of motion may be regarded as a memory remaining in the body of the experience to which it has been subject. At this position the wire will remain for ever unless it is subjected to some new experience. The memory that it retains is a permanent memory.

But the permanent set or structural memory is not the only effect left in the wire by the twist. If the couple is applied again and again removed, no increase of the set is produced. In order to produce a further set, a stronger couple must be applied. So that besides the permanent set, besides the statical effect, there remains also a dynamical change, such that the wire now reacts in a different way to incident motion. This we may call a dynamical memory of the experience.

If, instead of twisting the wire, we bend it, or hammer it, or distort it in any other way, the result, *mutatis mutandis*, is the same. If the change of shape is within the elastic limit, no permanent result remains. If the distortion is beyond the elastic limit, the metal retains a permanent set, which we term a statical or structural memory of the experience; and at the same time it acquires a new molecular disposition, such that in the future it reacts differently to incident motion. It retains a dynamical memory of its experience.

What is true of iron is true in various degree of other metals, and what is true of metals is true in various degree of other unorganised solids. All possess some elasticity, and all exhibit similar reactions to transient incidence of motion. The limit of perfect elasticity varies very widely. The amount of permanent set produced, and the alteration of reaction that is produced, are extremely various; but of all unorganised solids it is true that they possess some elasticity, assume some permanent set when distorted beyond the elastic limit, and thereafter react differently to incident motion.

The behaviour of organised solids under similar experiences is in some respects similar, while in others it presents important differences. They too are distorted by incident motion; they too possess elasticity in various degree; they too recover their exact shape when the distortion is within the elastic limit; they too take a set when distorted beyond this limit; and they too react differently thereafter to incident motion; but there are important differences.

If we clamp in a vice one end of a live stick, and if we take measures to observe precisely the behaviour of the free end, we shall find that when we hang a weight on to this free end, the stick bends. When we remove the weight, the stick returns, if the weight was light, to the exact position that it occupied before. In other words, it is elastic. If the weight is heavier, the stick does not return to that same position, but stops short of it. It takes a set. But now, if we watch it carefully, we shall find that this is not the end of the process. After a pause in its new position, the stick continues to return at a much slower rate towards its original shape; and this movement, which at first is distinctly visible from moment to moment, becomes slower and slower, until at last it is imperceptible; but still it continues for hours and days after it appears to have ceased. This is a new phenomenon, to which unorganised bodies exhibit no parallel. The stick takes a set, but the set is not permanent. It is a temporary set.

It disappears, or at least it diminishes; and it diminishes with varying, and for the most part with continually diminishing speed.

Still more different from that of the unorganised body is the dynamical memory of the organised body. When a bar of iron has been bent sufficiently to take a set, then, in order to bend it further, a greater force has to be employed than originally sufficed to bend it. The production of a set makes more difficult the production of a further set in the same direction. But when a stick has once been bent sufficiently to take a set, then it will take a further set upon the application of the same or even of a less force than was originally required to distort it.

There is yet a further difference between the memory of the unorganised body and that of the organised body, a difference which is exhibited both when the distortion is within and when it is beyond the original elastic limit. As we have seen, the iron or the steel, when it has been distorted within its elastic limit, returns to its original shape the moment the distorting agent ceases to act, and will return however often repeated or however long continued the action of that agent. The hair spring of a watch will suffer distortion of its shape ten million times in the course of a year, and yet, after many years of incessant action, it will exhibit no perceptible change of shape. With organised bodies the results of repeated or prolonged distortion are different. The bow that is in constant use "follows the string" at last,—it becomes permanently bent. After long use the top joint of a fishing-rod becomes permanently curved. A shelf will sag under a weight, and when the weight is removed will entirely recover itself; but apply the weight sufficiently often, or leave it long enough, and the sag will remain, the set will become permanent.

The behaviour of wood under distortion may be summarised thus: 1. It is, within limits, elastic, and if distorted within these limits, it instantly recovers its shape when the distorting agent ceases to act. 2. If distorted beyond its elastic limit, it retains a temporary set, which, after a pause, diminishes with varying velocity. 3. If the distortion, whether within or without the elastic limit, is sufficiently prolonged, or repeated sufficiently often, the set becomes permanent. 4. The distortion produces in the wood such a change that subsequent similar distortions are facilitated.

So far as the present argument is concerned, the stick, the bow,

fishing-rod, and the shelf may be looked upon not only as organised, but as live. So far as concerns the reactions that we have considered, they are in the same state as when they formed part of the living tree. If we subject a dead branch to similar experiences, it behaves in a totally different manner. Regarding the wood as live, it is evident that if we could apply to other live tissues the observations that we have made upon wood, our task of investigating the structural and dynamic memories of the human brain would be greatly facilitated. There is a very large body of facts, of which but a few samples can be given here, which harmonise with the assumption that living tissues generally exhibit reactions to distortion that follow the same course as those which we have seen to be exhibited by live wood.

Every organism has its specific shape, and, if it is distorted by a transient agent, it will begin after a time to return to its normal shape, by degrees that at first are rapid, and that thereafter continually diminish in velocity. But if the distortion is very great, or is often repeated, or is long continued, then the set becomes permanent.

A tree which is exposed to a prevailing wind, or which is darkened on one side, will grow lopsided; and if it is exposed long enough to these conditions the distortion will be permanent. But if, while the tree is young enough, that is, before the distorting agent has acted too long, its action is arrested, the tree will, after a pause, begin to recover its symmetrical shape; and it will recover by stages which at first increase in speed, and then become year by year slower and slower. Nay, if the distortion is increased to actual disruption the same redintegration often takes place. If the branch of a tree be broken, or if a limb is torn off a crab or a lobster, the set that is produced is not a permanent set. After a pause, the lost part begins to grow again, and the growth at first increases in speed, and thereafter diminishes until it becomes imperceptibly slow, so that the reproduced part does not for long, perhaps does not ever, attain to the dimensions of the lost part.

Moreover, it is to be noticed that in proportion to the immaturity of the part in course of construction is its vulnerability. The green succulent sprout, the soft immature claw, is more easily injured than its original. That is to say, when once it has been mutilated, when once it has been distorted, when once it has received a set, subsequent alteration in the same sense is facilitated.

Again, when the mutilation is repeated, subsequent reproduction is

less vigorous; and if the mutilation is repeated sufficiently often, reproduction fails. The temporary set becomes, after sufficient repetition, a permanent set.

Similarly when the higher animals are wounded, there is at first a pause, and then the process of repair sets in, with a speed which for a short time increases, and then gradually slackens, until the latest stages, the devascularisation of the scar, and its assimilation to adjoining tissues, become imperceptibly slow. Moreover, in proportion to the immaturity of the healing process is the vulnerability of the wound. It is more easily injured again than are uninjured parts. The set that has been impressed upon it facilitates a further set in the same direction. Furthermore, if the wound is opened again and again, or is not suffered to close, the healing process at length fails; the temporary set becomes a true permanent set.

When the old physicians spoke of the *vis medicatrix naturæ*, they did but express in other words the tendency of a set to disappear, the transiency of a distortion; and when the physicians of a later day insist upon the frequency with which acute change supervenes upon chronic, they do but state in different terms the existence of that dynamic memory which facilitates a further change in the same direction as a previous change.

It would scarcely be too fanciful a view to regard the succession of organisms in a race as a continuous body, subject to the influence of distorting agents. Such a distortion takes place when a race of animals or plants is subjected to new conditions of life; for instance, when a wild animal is domesticated, or a wild plant brought into cultivation. In such a case, the whole structure of the organism is profoundly modified. As long as the distorting agent acts, as long as the domestication continues, so long continues the distortion. But let individuals of the domesticated race escape and breed in wildness, and after a time they will begin to revert, both in themselves and in their offspring, to the feral type; and this change will take place at first with increasing and subsequently with diminishing speed. The race has received a temporary set, a structural memory of its experiences in the farmyard, the garden or the greenhouse, a set which diminishes when the distorting agent ceases to act. If we wish to modify the form of an organism, we shall more easily succeed by choosing for our experiment one that has already undergone recent modification than one of fixed type, for practical breeders know, although they express their knowledge in other

words, that a set once produced facilitates further change in the same direction.

It does not seem unjustifiable to infer that what is true of these gross and sensible distortions is true also of the delicate and infinitesimal distortions that are produced by every wave of motion that is incident upon the nervous system, which is so particularly and marvellously sensitive to disturbance by small increments of motion. We are justified in supposing that it is by the operation of what I have termed dynamic memory, by which a distortion facilitates subsequent distortion in the same sense, that the nervous system has acquired its marvellous sensitiveness to distortion by infinitesimal forces. And it is not a little significant that our conscious memories weaken and fade in much the same ratio to the lapse of time as does the structural memory of the stick. They remain bright and vivid for a short time, then they fade with increasing speed for a time, and then with slackening speed for an indefinite time thereafter.

The living organism is not only acted on; it reacts. It is not merely passive; it is active; and the mode of its action is determined by its structure. According as the structure is modified, so is the function modified. When a structural memory is formed in a tissue having an active function, all future function, all future action, is modified by the existence of the memory. This modification of function, that is conditioned by the formation of a structural memory, I call Active memory. So long as the structural memory lasts, so long is each exercise of function modified, and the degree of modification is in proportion to the degree of set that remains in the tissue. As the structural memory disappears with the lapse of time, so the mode of the function loses its new peculiarity and returns to the former mode.

Certain regions of the nervous system there are whose activity is accompanied by consciousness. When a new mode of activity occurs in these regions, a new mode of consciousness accompanies the activity. When the activity of that particular nervous process subsides, the accompanying state of consciousness dies away and ceases. But in the tissue is still left a structural memory, such that when that portion of tissue again becomes active, it becomes active in the same way. The process is punctually repeated, and the repetition of the activity, which I call active memory, is accompanied by a repetition of the mode of consciousness, which is conscious memory.

Thus there are four different conditions to which the term memory

is applied. There is Structural memory, which is an alteration in the position of the particles of the tissue. There is Dynamical memory, which is an alteration among the stresses of the shifted particles. There is Active memory, which is the altered process that takes place in the altered tissue; and there is Conscious memory, which is the conscious accompaniment of active memories in certain regions of the nervous system. The three latter forms depend, it will be seen, upon the Structural memory, to the consideration of which we may now return.

It is evident that the entire structure, not only of the nervous system, but of the whole organism, may be regarded as a group of statical memories; nay more, it is obvious that the same is true of the whole material universe. Every modification of form, whether gross or molecular, in every material body, has arisen under the stress of incident motion, and may be regarded as the structural memory of that experience. Confining our attention to organised bodies only, it is evident that the form which every organism assumes, whether in external contour or in internal organisation, is the structural memory which it has retained of the experiences that itself and its ancestors have undergone. Extravagant as the statement appears at first sight, it needs but little consideration to show that it is literally true, and true also that day by day, hour by hour and moment by moment, the organism, and especially its nervous system, is still acquiring structural memories under the experience of incident motion. So long as the structure thus modified remains functionally inactive, so long the conscious memory of the experience remains in abeyance. The moment that activity of function takes place in the tissue, at that moment a state of consciousness arises, which is the counterpart of the state that occurred on the formation of the structural memory, and that is the conscious memory of that experience.

The memories of experiences that are registered in the nervous system may be compared with the memories of aerial vibrations that are registered on the waxen cylinder of the phonograph. In both cases the structural change left by the experience bears no resemblance to the experience under which it arose. In both cases the structural change may remain for an indefinite time inert and passive, a mere change of shape, unaccompanied by any process which repeats or recalls the experience during which it was formed. In both cases the modified structure may be started into active function at any

moment by appropriate addition of motion; and in both cases it is then and then only that an experience is reproduced which is the more or less accurate counterpart of the experience under which the alteration of structure took place.

Each of the four forms of memory that have been enumerated demands separate consideration.

STRUCTURAL OR STATICAL MEMORY

Upon the structural change produced by an experience depend the endurance and the faithfulness of the conscious memory; indeed, when we speak of the endurance of a conscious memory, we use a figure of speech, for the conscious memory does not endure. What endures is the structural memory alone, and what is called the endurance of the conscious memory is the enduring liability of the structural memory to become active, and to be attended by consciousness. Keeping this distinction in our minds, it is evident, from the account already given of structural memory, that the endurance of a memory depends upon the amount of set that is impressed by the experience on the tissue; and that this differs much, not only as to different experiences, but as to different parts of the same experience. Of every distortion of tissue that is produced, for instance, by an impression on the senses, some parts are within the elastic limits of the tissue, and of these no memory remains; while other parts are distorted to various extents, and of these the endurance of the memory is in proportion to the degree of the distortion. In every distortion of tissue there are two elements to be considered, viz. the number of particles displaced, and the amount of their displacement—and the amount of displacement differs much in different parts of the area.

Suppose that you arrive overnight in a foreign town, and when you look out of your window in the morning you see a varied landscape of mountain and lake, tower and town, foliage and snow, each filled with innumerable detail. You turn away from the window, and immediately the greater portion of the scene is gone beyond recall. The faces in the streets, the stones and cart-tracks in the road, the details of the shapes of the houses, of the character of the foliage, of the lights and shadows on the mountains, of the waves on the lake, are all utterly and completely swept away, and of them no memory at all remains. Whatever distortion of tissue was produced by the motion arriving

from them was within the elastic limit of the tissue, and the instant the distorting agent ceased to act, the distortion disappeared. Thereafter, you do not find that the memories of the scene fade uniformly, but that they go piecemeal. What remains after the lapse of years is not a uniformly faded memory of the whole, but a memory of the most salient features only, all the rest having gone, not simultaneously, but by gradual and successive effacement.

What is meant by the faithfulness of a memory is the uniformity in the degree of set in different parts of the distorted area. So long as any part of the area retains its set, so long there is a structural memory of the experience; but if the proportion of the original set retained, and therefore the proportion of the original experience revivable, is but small, then, while some memory of the experience is retained, the memory is not faithful, for by faithfulness we mean completeness. Immediately after the landscape has been viewed, our memory of it is faithful, that is to say, it is detailed. The longer the interval that elapses, the less faithful, that is to say, the less detailed, is the memory.

Another meaning that is sometimes given to the term faithfulness, when applied to memory, is correctness. But this is a very different thing. A memory that is unfaithful in the sense of being imperfect, lacking in fulness of detail, need not be incorrect. Whatever part of the experience is remembered may be correctly remembered, although this part may be but small. But very commonly with unfaithfulness of experience there goes incorrectness also. Very commonly the lacunæ that are left by the disappearance of parts of the memory are not left as mere nothingness, but are recognised to be lacunæ and to need filling; and when this is the case they very often are filled by a process of thought, and are erroneously filled. We have constantly to keep in mind the organisation that exists in our knowledge. A memory exists, an experience is remembered, not as an isolated, unique, unconnected thing, but as a related member of an organised whole; and the absence of any member of an organised whole is conspicuous. To take an instance, the scheme of thought that includes within its boundaries anything possessing individuality, includes also, in inseparable relation with the individuality, the thought of nomenclature. For everything that is individually conceived, the attachment of a name is an inevitable suggestion. If the thing and the name have been experienced in relation, a memory is formed, and so long as the

memory remains faithful, that is, complete, detailed, the thing and its name are remembered together. But if the memory becomes unfaithful, and the name is lost, the scheme of organised thought still remains, but remains with a lacuna. We have forgotten the name of the thing, but we have not forgotten that it has a name; and the appreciation of the gap in the remembrance is irksome. It is an obstruction to thought; it is displeasing; and we endeavour to fill it. We fill out the empty outline by supplying if we can the true name. But the gap is so irksome that it is often filled by a name that is not the true one, and in this case we may or may not be aware of our error. If a wrong name is supplied, and we remain unaware that it is wrong, then the memory is incorrect, and this incorrectness is often confused with unfaithfulness, from which it is evidently very different. The substitution of a wrong name is far from being the only case of this erroneous memory. A portion of a landscape which escaped attention may produce a structural memory much less enduring than the remainder, and in the memory of the whole, the lacuna may be filled by the substitution of a part of some other similar landscape, and thus may be formed a memory that is not merely unfaithful but erroneous. Unfaithfulness of memory, properly so called, is want of detail in the remembered experience, due to the disappearance of the less pronounced portions of the set in the lapse of time. It is due to the fact that, over the disturbed area of nerve tissue, the disturbance varies in degree. Faithfulness of memory, as well as endurance of memory, depends, therefore, upon the amount of the set imposed upon the tissue by the experience. The conditions which determine the one determine the other, and the determining factors of both may therefore be considered together.

Upon what factors then does the initial amount of the set depend, since on this depend both the endurance and the faithfulness of memories? We can scarcely be wrong in supposing that in this, as in other cases, the distortion produced in a body by incident motion is directly proportional to the amount of motion incident, and inversely proportional to the inertia of the particles of the body—to the resistance which they oppose to distortion. The first factor need not be laboured. We all know that the stronger the impression made upon us, the longer and the more faithfully it is remembered. Our ancestors, when they took schoolboys to the boundary of the parish, and there flogged them, were quite aware that a strong impression produces an enduring memory,

and the whole experience of our lives testifies to the truth of the statement.

But with the same degree of impressiveness of experience, memories differ enormously in the length of their endurance. They differ not only in different people, but in different parts of the same brain, and in the same part of the same brain at different periods of life, and under different circumstances. These differences are of two kinds. There are original differences of inertia in the particles of different brains and of different parts of the same brain, and at different periods of life; and there are acquired or adventitious differences in the same part of the same brain at closely adjacent times, dependent upon variations in the state of the tissue that is subject to the distortion.

That the susceptibility to distortion, the ability to take a set, the capability of acquiring a structural memory, differs much in different individuals, needs no insistence. There are those who, like Porson, Dr. Johnson and Macaulay, by a single attentive perusal can attain an enduring memory of page after page of printed matter; and there are those who cannot for the life of them commit to memory a four line verse. But the very same individual who can repeat verbatim a leader in the *Times* after a single perusal, may be unable to remember in their order the notes of the popular air that he hears twenty times a day, played by street organs and whistled by errand boys. One man, on his return from hearing an opera for the first time, can reproduce faithfully upon the violin the principal airs, but is unable to remember the appearance of the singers. Another can sketch from memory striking likenesses of the performers, but retains a very confused and incorrect memory of the plot; while a third grasps the whole story of the drama, but remembers nothing of the music. In some men, the remembrance of a single painful experience endures for a lifetime. They remain ever after on the alert to avoid a similar experience. "The scalded dog fears cold water." "He who was bitten by a snake fears a rope." One man who has lost money in a rash speculation will be careful ever after how he makes his investments. Another, in spite of repeated losses, will go on plunging, though his memory for verbal successions or muscular adjustments may be exceptionally good.

The difference in the endurance of memories acquired at different times of life is sufficiently notorious. It is usually accepted that the memory is better in the young than in the old; that in youth the mind

is "wax to receive and marble to retain"; and the difference is in truth often very conspicuous, but it is not so uniformly in favour of youth as is often assumed. Set a child and an adult to learn the same form of words. The child, when he has learnt it, will no doubt retain it much longer; but the adult will very much sooner acquire a memory of the passage which will enable him to repeat it, though this memory will be but a temporary one. This ease of acquirement is not in favour of the adult in all departments, however. The memory of muscular adjustments is much more easily acquired in youth, and is much longer retained. "You cannot teach an old dog new tricks." Children learn a new language with the greatest facility when they hear it spoken, and the ability to learn a new language diminishes steadily with advancing age. A high degree of skill in any form of muscular adjustment cannot be acquired unless the exercise is begun in early life. No one can become an efficient performer on any musical instrument who begins after his teens, nor can anyone, beginning after that age, become a first-class horseman, or shot, or billiard player, or draughtsman, or latheman, or proficient in any handicraft. On the other hand, there are experiences that are remembered better in adult life than in youth. Trains of reasoning are then better remembered. The memories of colours, of sounds, and of other sensations appear to improve; and the memory of pleasure and pain certainly does so. Memories of pains are very transient in youth, and hence arises in part the recklessness and adventurousness of that time of life. In age, such memories are very enduring, and the old are correspondingly cautious; but, of course, there are other factors, such as repetition, which go to reinforce the effect.

More important for practical purposes are the differences, in the capacity to receive a set, which are exhibited by the very same tissue at different times and in different circumstances. Structural memory is not peculiar to brain tissue, nor even to living matter. It is common to all solids; and in all solids, under practically all circumstances, it is found that the inertia of the particles is diminished, and the production of set facilitated, by increasing the quantity of free motion among the particles. If we wish to forge a bar of iron into a new shape, we can immensely facilitate the production of the set that we wish to impose by heating the bar to redness; that is to say, by greatly increasing the individual motion of its particles. The maker of whips and walking-sticks, who wishes to bend a hook upon a stick, or to straighten a kink

out of its shaft, puts it into a bath of hot sand, and when he has by this means sufficiently increased the intrinsic motion of its particles, he can bend the stick with ease to whatever shape he wills, and whatever shape he then gives it will endure. The set is easily imposed, and it is permanent. In the brain also it appears that the production of set is facilitated by increase in the intrinsic motion of its particles, for we find that experiences that occur when the brain is unusually active are remembered with unusual tenacity, and *vice versâ*.

When is the activity of the highest nerve regions at its lowest ebb? Unquestionably during sleep. Yet during sleep these regions do become active under the stimulus of incident motion, as is proved to us by the occurrence of dreams. And a peculiarity of dreams, which marks them off very sharply from other conscious experiences, is the difficulty with which they can be revived, and especially the difficulty of faithful revival. We wake with the knowledge that we have had a dream, and certain features of the dream are revivable; but the memory is elusive. We cannot revive it faithfully. It is blurred, indefinite, inaccurate, and faint in comparison with the recentness and vividness of the experience. Moreover, it does not endure. To remember a dream forty-eight hours after its occurrence is very rarely possible.

On the other hand, when is the general activity of the brain at its maximum? Surely at times of great emotional storm and stress. In states of great excitement. In moments of peril, of enthusiasm, of joy, anger, and all powerful emotion. And experiences that occur at such times produce very enduring memories. What woman forgets the incidents of her first ball, of her engagement, of her wedding, of the birth or the death of her child? What man forgets his first assumption of remunerated labour; or his first assumption of the responsibilities of life; or the scene in which he took his degree; or his election to a coveted post; or the announcement of the loss or gain of an important law suit? The man who is in peril in a burning house remembers for the rest of his life incidents that the firemen who rescue him have forgotten in five minutes; for the impression is made, in the one case, on a brain already in a high state of activity, in the other on a brain that is comparatively quiescent. In these considerations we gain, however, but little practical aid towards facilitating the acquisition of memories, for a system of mnemonics which could ensure our recollecting an event only by burning down the house when

it happened, would be too costly for everyday use. Fortunately it is not our only expedient.

There is another mental state in which we have reason to believe that the intrinsic motion of the cerebral elements is increased, at any rate locally, and in this state also experiences that affect the active locality are peculiarly enduring. This is the state of attention. Whether the physical substratum of attention is, as is here contended, the emission of motion from some central nerve region or no, it will, I think, be universally admitted that it is at any rate an active condition. It is a condition in which more free motion exists in the brain, the cerebral elements are in greater activity, the molecular or particular motion is of greater amplitude and vivacity, than in states of inattention; and correspondingly we find that there is no means at our disposal so effectual, for increasing the endurance of memories, as giving attention to the experiences that we wish to remember. As far as the consequent endurance of the memory is concerned, it does not appear to matter whether the attention which gives permanence to the change is reflex or voluntary. The amount of attention given appears to be the determining factor, irrespective of its mode of origin.

Another influence, which unquestionably increases the endurance of memories, is the habit, or custom, or cultivation, of remembering. It does not seem improbable that, by frequent displacement, the cerebral elements may become more easily displaced, and thus we may account in part for the improvement in the ability to remember that is brought about by practice.

A factor which is adverted to in another place, is the organisation of memories into complex groups, which is one of the functions of thought. There are few or no memories which are mere isolated disconnected structural arrangements, standing alone and destitute of relations with surrounding structures. Each newly acquired memory is incorporated into our stock of knowledge, and takes a definite place as part of an orderly and organised system; and the more thorough the incorporation, the more complete the organisation, the more enduring is the newly acquired portion. To take a very simple case: I find, in a country walk, a plant that is new to me. Unless I have beforehand in my mind an organised stock of knowledge about plants, I shall not observe the new plant; I shall not know that it is new; the impression of its appearance may be made upon my senses, but it will leave no memory at all. But if I already

possess some knowledge of botany, the novelty, the difference protruding through similarity, attracts attention, and as attention is given, a memory remains. And the endurance of this memory depends largely upon the amount of organised knowledge that I already possess of wild plants, and the definiteness with which I am able to assign the new acquisition to its place in that organisation. If I merely have a dilettante knowledge of wild flowers, my memory of the new plant will not be good enough to enable me to describe it accurately in its absence. But if I have a botanist's knowledge of the natural order to which it belongs, I shall be able to remember its peculiarities by the likenesses and differences between it and its allies; and the more complete my previous knowledge, the more accurate and enduring will be the new remembrance. It may appear as if the improvement in the individual memory, that results from this previous knowledge, can be resolved into the superiority of attention that the plant attracts through its means; but a little consideration will show that this is not so. If we had no previous botanical knowledge, a very much greater concentration of attention would not enable us to remember the appearance of the plant nearly so well. The previous knowledge of botany in general, and of the particular natural order, would be called by some psychologists an apperceptive system, and it would be said that the endurance of the memory of the plant was increased by its apperception into these systems, but whether this nomenclature adds anything to our knowledge of the facts does not seem to me to be ascertained.

A question which has often been mooted is whether we ever forget, —whether a structural memory, once formed, is ever entirely obliterated. Many cases have been recorded, of which the most striking and the best known is that related by Coleridge, which seem to indicate that structural memories may remain inert for an indefinite time, and may at length be vivified and become active. In Coleridge's well-known case, an illiterate servant-girl recited for hours together in Greek and Hebrew. She had been in the service of a learned pastor, who was accustomed to read the Greek and Hebrew classics aloud in her hearing. All unknown to herself, these impressions had created structural memories in her brain, and, upon a stimulus of exceptional intensity, these structural memories had become active. This question we can answer in part with assurance, and for the rest with a high degree of likelihood. If the distortion of tissue which the experience

produces is within the elastic limit of the tissue, then without doubt the structural disposition of the tissue returns to the *status quo ante*, and no structural memory whatever is retained. But if the distortion is sufficient to produce a set, then, after a pause and a start, the set gradually diminishes; the tissue returns with gradually diminishing speed to its original shape. It becomes in the course of time so obsolescent that no stimulus of ordinary intensity will arouse it into activity; but does it ever wholly disappear and leave no trace behind? Such evidence as we have leads us to suppose that it never does wholly disappear. If, as seems to be the case, the return towards the *status quo ante* is made with continually diminishing velocity, then it seems that the approach to the original position is an asymptote; that is to say, that it continually approaches the state of rest, but never reaches it, and that some degree of structural memory is always retained. If this be so, then these experiences we never do completely forget, for as long as structural memory exists, so long will active memory remain possible.

In the course of their diminution and disappearance, we find that conscious memories display a singular accordance with the return of the stick to its original shape after a temporary set has been imposed upon it; that is to say, there is first of all a pause, of variable duration, in which no appreciable diminution takes place. Then the memory diminishes rapidly, and very soon the speed begins to slacken, and thereafter the set diminishes for an indefinite time, with a velocity that continually diminishes, and that becomes, in its later stages, imperceptibly slow.

That forms of words, muscular adjustments, routes across country, the appearance of things, are better remembered the more recently they have been experienced, is embodied in all the arrangements of our lives. It is the knowledge of this law that makes us marvel at the recognition of Ulysses by his dog; it is the knowledge of this law that makes us disbelieve the evidence of the witness when he says that he cannot remember the evidence that he gave yesterday, or that he can remember clearly what happened twenty years ago. But these are not the only departments in which the rule holds good. It is true in an eminent degree of pleasure and pain also. He who has recently suffered from eating an indigestible dish, will not now repeat his experience; but with the lapse of time the memory fades, and he ventures upon it again. At intervals of a few years the public at large

launches out into wild speculation. All kinds of wild-cat properties are eagerly sought after, and swallowed with avidity at preposterous prices. Then comes a smash. Some are ruined. Many lose severely. For a time there is a total absence of speculation. But after a period of depression business begins to revive. Confidence is said to be restored. Investment takes place once more, at first tentatively and cautiously, but as the period of previous losses recedes more and more into the past, the pain that they inflicted is remembered less and less, until it ceases to have any operative effect upon conduct.

Dynamic Memory. This is so vast a subject that, although it underlies the whole of psychology, it can be dealt with only very cursorily in a book which does not professedly deal with the physiological aspect of the science. We have seen how the dynamic memory of living matter differs from that of non-living matter. In the one the production of a set renders more difficult, it impedes and obstructs further change in the same direction. The reapplication of the same force produces no increase of set. In the other, the set once produced is but the preparation for the further set that takes place when the force is reapplied, and every continuance or reapplication of the distorting agent increases the dimension of the set. It needs but little consideration to show that this remarkable property of living matter is the basis of all progress, of all improvement, of all intelligence, even of all morality. It is by virtue of this quality that practice makes perfect, that use becomes a second nature. It is owing to this property that repetition of an experience has so powerful an effect in fixing the memory of the experience. Every repetition of a distortion increases the set which the distortion leaves behind it; and the more pronounced the set, the longer, manifestly, will it be before it is obliterated by the gradual return of the tissue to its original form; and when the distortion is repeated sufficiently often, the temporary set becomes a true permanent set. In practice, the power of repetition in increasing the endurance of memories is very fully recognised, and the strength or goodness of the memory is often estimated to be inversely as the number of repetitions necessary to establish an enduring memory. The power of repetition in fixing and rendering permanent the set produced, is conspicuous in all examples of memory, but perhaps most conspicuous in the case of muscular adjustments. Movements which have been very many times repeated, and have then been neglected, can be resumed after the lapse of years with no appreciable lack of

precision beyond what can be accounted for by disuse of muscles. A boy who has once learnt to skate, or to ride, or to bicycle, and who has neglected his accomplishment for many years, can resume it with as great proficiency as he left off with, as soon as the stiffness of his muscles has passed off. A handicraft, once learnt, is never forgotten.

The influence of dynamic memory is, however, far more extensive and widely diffused than is evidenced by the mere perfecting of structural memory by means of repetition. When once a new process has been effected in the nervous tissue, not only is the future performance of that process made more easy and more sure, but the neighbouring tissue is, it appears, so modified, that all processes of like nature are facilitated, and facilitated in proportion to their likeness. When a new fact has been observed; when a new muscular adjustment has been achieved; when a new train of reasoning has been thought out; when a new inhibition has been exercised; a change is produced in the nervous tissue, a dynamic memory is retained, such that not only is the same process made more easy, more ready and more sure for the future, but cognate changes also are facilitated. Not only is a new instance of that particular fact more obvious, but observation is quickened as to all similar facts, and, in degree varying with their similarity, as to all facts whatever. Not only is that particular feat of dexterity more easily performed, but all similar feats also, and all feats whatever in degree varying with their similarity. Not only is the ability to compare, to distinguish likeness and difference, increased as to the particular matter reasoned about, but the whole reasoning power is strengthened by the exercise. By each act of self-control, not only is it easier to exercise self-control with regard to that particular indulgence, but to exercise self-control generally, and with regard to all indulgences; and thus, as has been said, on this property which I have called dynamic memory, rests not only all intelligence and all progress, but all morality also; for morality and self-control are in practice almost convertible terms.

Active Memory is no exclusive possession of the nervous system, nor even of living beings. The nervous system displays active memory not as a living tissue, but as a mechanism, and shares with every mechanism, living or dead, animate or inanimate, the property of reproducing, in its working, an active memory of the experiences that it underwent during its construction. With very many mechanisms, outside as well as inside the living organism, the structural arrange-

ment can be altered, and thereupon the mode of working is so modified that the output is altered. A lathe may be so set that it produces a screw, or a cone, or a cylinder, or a sphere, or what not; and the form that its activity takes when it is set in motion is determined by the structural arrangement—the structural memory—that was impressed upon it. A loom may be set to produce a pattern of fern leaves, or roses, or zigzags, or Grecian keys, or what not, and whatever pattern it produces is determined by the structural memory that is impressed upon it. Set the type in one way, and the resulting page is a scene from Shakespeare; set it in another way, and the output is the conjugation of a verb, or the description of a horse-race. And similarly, the cylinder of the phonograph may be impressed by a political speech, or by a sonata, or a comic song; and when it is set in motion, the mode of action, the output, or what I have termed the active memory, will faithfully reflect the experience under which the structural memory was formed.

In all these cases the mechanism may remain for an indefinite time disposed in a certain definite structural arrangement—retaining a structural memory—but inactive. But connect the loom, or the lathe, or the printing press, with the engine; connect the phonograph with the battery; and immediately the mechanism starts into an activity whose form and mode are determined by the structural memory that has been impressed upon it. And similarly in the nervous system, the structural memory may remain for an indefinite time inactive, latent, inert, the seat of no activity, the occasion of no mode of consciousness. But the moment the nervous mechanism becomes active, its activity assumes a form which is determined by the structure, and thus the structural memory asserts itself. It asserts itself in much the same way as the structural memory of the phonograph asserts itself; that is to say, it impresses upon the activity a form or mode which is the counterpart of the experience under which the structural memory was itself formed. Whatever aerial waves impress upon the phonograph a modification of its structure, the counterparts of those same waves are given out from it when it becomes active. In whatever way the activity of the nervous tissue is modified by an experience, the same modification is manifested whenever that tissue again becomes active; and this is active memory.

Although the inanimate and the living mechanisms are closely alike in the respects that have been considered, there is another respect in

which they are antithetically different. Every exercise of activity in the inanimate mechanism impairs the structural memory and deteriorates the quality of the output. The bearings and screws of the lathe wear away, and the quality of the product deteriorates. The running parts of the loom wear loose, and the pattern of the cloth loses its definition. The face of the type becomes worn, and the character of the impression suffers. The gutter in the waxen cylinder of the phonograph becomes smoothed by the friction of the style, and the truth of the sounds is blurred and diminished. But with the nervous mechanism, owing to the opposite quality of the dynamic memory of live tissue, activity of function has the opposite effect. Every exercise of activity on the part of the nervous mechanism defines, consolidates, and improves the structural memory, and renders its future activity more facile, more certain, and more accurate.

Conscious Memory. The functional activity of a certain region of the nervous system is accompanied by consciousness. When, in this region, the functional activity is modified by an experience, the modification is attended by a modification of consciousness; and when that nervous process again becomes active, the active memory is accompanied by a phase of consciousness, which reproduces the modification. This repetition of a mode of consciousness is conscious memory. So long as the structural memory remains, but remains the seat of no active process, so long conscious memory remains possible but not actual. Only when an active process, an active memory, takes place in the altered structure, does conscious memory arise. If, by violence or by disease, the structural memory is obliterated, the corresponding conscious memory is for ever lost. When we speak of a man with a well-stored mind, we mean a man with a large number of structural memories in the higher regions of his nervous system. When we are subject to a new mode of experience; when a novel impression reaches us from without; when a new combination of motion is effected within, or is emitted from, the highest regions of the nervous system; then arises a novel state of consciousness, which we term a sensation, thought, or volition as the case may be. In either case, the portion of tissue involved in the process is disposed in a new arrangement, part at least of which endures as a temporary set, and is a structural memory of the event. Whenever this altered tissue again becomes functionally active, it repeats the mode of activity, as determined by its structure, and this repetition of the activity is an active memory

of the experience. At the same time that this active memory occurs, there arises in consciousness a state that is the counterpart of the state that occurred on the occasion of the first experience, and this reproduction of the state of consciousness is the conscious memory of the experience.

So far there is a parallelism between conscious memory and the physical memories. The more complete the structural memory, the more faithful the conscious memory. The more vigorous the active memory, the more vivid the conscious memory. But this parallelism exists only so far as we have traced it. It holds good completely for the first reproduction only. With every subsequent recurrence of the active memory, the structual memory becomes more complete and enduring; and as the structural memory becomes better organised, so does the active memory become more easily evoked and more vigorous. But precisely in proportion as the active memory thus improves, in that same proportion does the conscious memory weaken and fade. It is the movements that are most often performed that are performed with least effort; it is in the places with which we are most familiar thta we find our way with least thought; it is the form of words that is most often in our mouths that we utter with least sense of its meaning; it is the scenery to which we are most accustomed that arouses the smallest interest. The more complete and consolidated and organised the structure, the more facile and certain and readily provoked the function, the less of conscious memory there is; and when structure becomes complete and function perfect, conscious memory altogether disappears.

By thus distinguishing the several conditions to which the term "memory" has been, or may be, applied, we are able to clear up some of the difficulties which perplexed our predecessors. One of the most puzzling problems with which the philosophers of a past generation had to deal was, What becomes of a memory when it is not actually being remembered? "We are conscious," says Sir W. Hamilton, "of certain cognitions as acquired, and we are conscious of these cognitions as resuscitated. That in the interval, when out of consciousness, they do continue to subsist in the mind, is an hypothesis, because whatever is out of consciousness can only be assumed . . . but if it cannot be denied that the knowledge we have acquired . . . does actually continue, though out of consciousness, to endure, can we in the second place find any ground on which to explain the possibility of this endurance?"

"The solution of this problem," he says in another place, "is to be sought in the theory of obscure or latent modifications (that is, mental activities, real, but beyond the sphere of consciousness)." Thus Sir William Hamilton satisfies himself by an explanation that is purely verbal, and has no meaning whatever behind it; that is, indeed, as Mill pointed out, a contradiction in terms. To us the problem presents no difficulty. It is, in fact, wrongly stated. It rests upon a confusion about the facts. It is much the same as asking what has become of the colour of the sky at midnight; where does the motion of the engine reside when the steam is cut off; where does the light of the candle go to when the flame is blown out; where is the clangour of the bell stored away before the bell is rung? As we should explain it, conscious memories do not exist except in process of revival, any more than the sound of the bell exists except when it is ringing; any more than the light of the candle exists except when it is burning. What endures, when a conscious state is revivable but not actually revived, is not a conscious state at all, but a structural modification of tissue. When this modified tissue becomes active, then the conscious state recurs, just as, when the bell is struck, it sounds again.

Very similar is the explanation of subliminal mental states, and of unconscious mental processes; but in these cases there is the difference that an active memory, or active nerve process, takes place within the region in which processes are accompanied by consciousness, and yet has no conscious accompaniment. Various explanations have been offered, most of them supposing that the process has a mental accompaniment, but that this accompaniment is so faint as to escape the attention. The hypothesis of a subliminal consciousness, an unconscious consciousness, seems to me a contradiction in terms. That a state of mind should be so faint that it may pass unattended to, is an experience with which we are all familiar; but a state of mind of which no effort of attention can give any inkling, seems to me a verbal expression without any meaning in it. On the other hand, I can very well understand and believe that a nervous process which would ordinarily be attended by consciousness, or which belongs to a class that is ordinarily so attended, may be destitute of conscious accompaniment under certain circumstances. I can conceive it to be so destitute if it occurs very slowly, for a suddenness as well as amount of change is an important ingredient in consciousness; I can conceive it to be so destitute if the area of tissue in which the change takes place

is isolated from other active areas by a zone of inactive tissue; and there are other conceivable circumstances which render the hypothesis of unconscious "cerebration" tenable, without an assumption so meaningless to most people as subliminal consciousness.

A conscious memory is usually understood to mean the revival or recurrence of a conscious state that has been experienced before, or, as has been expressed in a previous page, the counterpart of some previous conscious state; but such an expression does not accurately express the meaning of the term, for not every repetition or recurrence of a conscious state is a memory, and a memory is more than a mere repetition or recurrence. It is not the exact counterpart of a previous state. When a sensation, a percept, or a volition recurs with all the intensity and other features of its original occurrence, it is not said that it is remembered, but that it is repeated. It may be recognised as having been experienced before, but this recognition, though it is often called remembering, and though it includes remembering, is a process of thought, and is more than remembering. By a memory pure and simple we mean, not merely the recurrence of a conscious state, but its recurrence with differences. The memory is lacking in some of the elements of the original, and contains elements which the original was without. The memory of a sensation, percept, or volition differs from the original state in the absence of presented elements; in the absence of impressions of sense, whether of the special sense organs or of those which arise from muscular movement. If these impressions of sense exist in the recurring conscious state, we do not speak of it as a memory, but as a repetition of the previous state. We may indeed, when we experience a sensation, a percept, or a volition for a second time, say, "I remember this happening before," but in such a case we distinguish quite clearly between the state that we experience and the memory. In the case of thought, there is no presented or impressed element in the conscious state, but there is a sense of effort which performs the same function, being present in the original, absent in the revised state. A memory is not therefore a mere repetition of a previously experienced state. It lacks an element which was present in its original.

Moreover, a conscious memory always includes an element which was not present in the original state. It contains some differentia which enables us to identify it as a recurrence and to discriminate it from an original experience. This differentia is not lack of intensity

nor lack of detail, for although the memory is always less intense and less detailed than its own original, yet it is not necessarily more deficient in these qualities than other originals. However faint and feeble and confused may be a sensation or a percept, it is always and instantly recognised to be qualitatively different from the memory of a sensation or percept. However feeble the sensation, we are always irresistibly convinced that here and now we are receiving an impression. However vivid the memory, we are irresistibly convinced that the experience to which it relates is not here and now, but belongs to the past; that it is a replica, not an original. A memory of a percept which had not this mark of memory, but was a true and exact repetition of its original, would not be a memory as ordinarily understood. It would certainly not be known as a memory. It would be an hallucination. When we have the memory of the appearance of a thing, we at once recognise that this memory is like the original, and at the same time that it is different. How this difference can be known is puzzling. Nothing can be more certain than that it is known, and yet how can the remembered or represented state be compared with the original or presented state and known to be different, unless both are present in consciousness? And the original state is certainly not present. All that we have is the memory. At this moment there is no percept to compare the memory with, and yet the memory is known to be different from what the percept would be if we had it. The explanation seems to be as follows. Although we have now not that specific percept which the memory reproduces, yet the whole of our waking lives is a succession of percepts running alongside of, and intermingled with, a stream of memories; and the two series are being perpetually compared and perpetually discriminated; so that, when a member of either series appears in consciousness, it is at once classed with its congeners and referred to its proper series. I cannot compare my memory of the appearance of the outside of my house, or of the knife in my pocket, with its respective percept, because I have no such percept here and now; but, by long and constant experience of the difference between memories and percepts, any specimen of either is referred to its proper class as soon as it appears.

Every memory therefore, to be known as a memory, contains of necessity an element of thought—includes of necessity a comparison with its original. Because of its similarity it is known to be a memory *of that original;* because of its difference it is known to be a memory of

that original. Here again, as in so many other places, we meet with the interconnection of mental states. We find that states that appear to be simple are in reality very complex, and that no single mental process, such as we analytically describe, ever occurs in its purity, but always needs the co-operation of others for its occurrence.

In addition to the cognition that is contained in every memory—that it is a memory and not an original state—there are two other characteristics that belong to every normal memory. The first of these is a localisation in time of the original to which the memory refers; the second may be termed its localisation in space, by which is meant its association or connection with other contemporaneous or contiguous mental states.

The mode in which we estimate duration, or intervals of time, does not fall within the scope of this work; but whatever the mode, some estimate of the interval of time, that has elapsed between the resuscitation and the original experience, is an integral constituent of every memory; and without it the memory is not complete, it is not entitled to be called a memory. The representation of an event, to which we can attach no localisation in time, would not be referred to time past, and the reference to past time will be admitted to be an essential ingredient in memory; but beyond this, some localisation in past time is necessary. In the case of an experience that is frequently repeated, the cognition is not prominent; but still it is there, as we find if there is any considerable variation in frequency. Then, when the representation takes place, we notice at once how long it is since we saw So-and-so, or how short a time since last the clock struck, or what not. In the case of single experiences the estimate is often very inexact. Several winters ago I had four or five days' successive sleighing, but how many years ago I could not say with any exactitude. It might have been five, eight or ten. It was certainly more than three, however, and certainly less than twenty. The localisation is very vague, but there is a localisation; and without the localisation the memory is not complete, it is not a memory, but an isolated independent concept.

In addition to this localisation in time, a further localisation among the associates or accompaniments of the experience is an integral constituent of a complete memory. How necessary it is, becomes apparent when it is wanting, when we have occasion to say, "Where have I seen that force before?" "Whom does So-and-so remind me of?" "The name is familiar to me, but I cannot remember where I have heard it."

"I know the passage quite well, but I cannot remember the context." These associates or accompaniments of a memory are of two classes. They may be associates merely, fortuitously connected with the original experience, as in the case of the particular surroundings in which a person was met with, or the room in which a conversation was held; or they may compose an organised body of knowledge of which the particular memory is a vital part, from which it cannot be dissociated without ceasing to be. Thus, when I remember the appearance of, say, a snail, I not only remember its appearance, but I assign to this appearance a definite position among things. I remember it, not merely as a small, soft, shiny object of certain form and colour, but I remember it as an animal, as an animal of a low degree of organisation in comparison with some other animals, of a high degree in comparison with others. I classify it. I assign to it its place in an organised body of knowledge. If I am a gardener, I further place it among the noxious agents against which in the course of my business I have to contend. If I am a zoologist, I place it among other gasteropoda, in a definite position in a scheme of classification of animal forms. And this localisation is an integral constituent of the memory. If the appearance of the snail were remembered by the zoologist without any localisation of it among gasteropods, or by the gardener without localisation among garden pests, or by the casual observer without localisation among inferior animals, the memory would not be complete. It would not be a memory of the specific thing, but of a certain appearance only, and it is very doubtful whether even as an appearance it would be remembered at all.

Entirely distinct from the four forms of memories that we have considered is the process of remembering. Active memory is a process, it is true, but a process different from the one that we are about to consider. Active memory is the activity of a mechanism; the process of remembering is the starting into activity of a mechanism. The one is the motion of the lathe, or the loom, or the printing press, when it is connected with the engine; the other is the act of making the connection between the engine and the machine, so that the mechanism may be put in motion. It is not the action of the engine, but the turning on of steam. It is not the movement of the motor, but the switching on of the current. The conscious memory is the appearance that arises in the mind; the process of remembering is the process of bringing this appearance into the mind. The one is

the answer to What do we remember? the other is the answer to How do we remember?

We may consider remembrance either from the physical point of view, seeking to determine how a structural memory becomes active; or from the introspective point of view, seeking to determine how a conscious state is revived or represented in the mind; and if the investigation is rightly conducted, the results of the two inquiries ought to harmonise.

Taking first the physical point of view, we must regard the nervous system as a physical mechanism, subject to the laws which regulate the movements of matter. Of these laws, the first and most fundamental is that a body at rest will continue at rest until acted upon by some extraneous force. In other words, the condition of the coming into activity of the mechanism is the reception of motion. Events in the highest nerve regions no more than events elsewhere take place at random. They are subject to law; and the law which governs the liberation of motion is the antecedent addition of motion. Gunpowder will not explode without the spark; iron will not glow until it is heated; seed will not germinate without warmth; and nerve tissue will not become active unless it is provoked by the addition of motion. Now there are two ways in which the nervous system, in common with some other mechanisms, receives motion. The first way is by communication from without. Bodies or particles in motion come in contact with nerve substance and deliver to it a portion of their free motion. The body or particle may or may not remain in contact with the nerve substance, but in any case remains outside of it. The second way in which the nerve tissue receives motion is by the incorporation into its substance of particles which contain a large quantity of internal motion, motion which is subsequently set free within the substance of the nerve tissue. Similarly, a ship may receive motion by the impact of the wind upon its sails, in which case the communication of the free motion is immediate, or it may receive motion by the delivery of coal into its bunkers, in which case the stored motion of the coal is subsequently set free within the structure of the ship. The initiation of a nervous process, the vivifying or starting into activity of a structural memory, may take place by the addition of motion from either of these sources. The motion may be communicated from without, or a tract of nerve tissue may, by the mere aggregation into its substance of molecules containing large amounts of stored motion, become

so replete, that the tension becomes too great for the controlling agency to cope with, and the process then starts into action as it were spontaneously. In the first case, when the motion is communicated from without the tract of nerve tissue concerned, it must of course come from some other tract of nerve tissue, since the highest nerve regions are in direct communication with other nerve regions only; but ultimately it may come either from the spontaneous activity of these other regions, or it may come through them from without the body. An instance of the initiation of active memories by communication of motion is seen in such a train of successive processes as the performance of a well-learnt piece of music, or the repetition of a verbal formula. The most conspicuous instance of the initiation of active memories by the spontaneous outbreak of accumulated motion is the daily awakening from sleep.

The revival of activity in a nerve region by communication of motion from neighbouring regions must be conditioned in the main by the number and permeability of the channels by which it is connected with these neighbouring regions. The more numerous and the more permeable these channels, the more readily can motion reach the area in question, and the more are the chances of revival of activity in it. Contrariwise, when the channels of communication are few, and especially when they are but slightly and with difficulty permeable, the chances of revival will be few. It is evident that the channels of communication between nerve areas are themselves structural memories; they are states left by previous processes, and all that has been said of structural memories applies to them. Much will depend also upon the degree of activity of—the degree of free motion in—the areas with which communication exists. If they are in high and frequent activity, well plenished with stored motion, so much the more readily will motion be emitted from them, and *vice versâ*. Thus on the one hand there are memories, such as those of the daily handicraft, of familiar names, of frequently repeated sequences, which occur with a maximum of ease, since by innumerable repetitions in varied circumstances their connections with surrounding memories are many and close. At the opposite extreme are the memories of dreams, whose extreme difficulty of revival is consonant with the extreme paucity of collateral channels of communication.

Leaving now these most general aspects of the subject, we may go on to consider in more detail the process by which conscious memories are

revived and the nature of the conscious memories which result from the process; and in these investigations we shall find our preliminary studies of considerable assistance.

In going through a greenhouse yesterday I encountered a vegetable joke in the shape of a curious cactus. Immediately I saw it, I was reminded of a similar one that I once saw in the Duke of Devonshire's garden at Chatsworth. It stood upon a bed of broken stone on the right-hand side of the hothouse as I passed through. There was a *Plumbago capensis* trained to the rafter above. A. and B. and C. were of the party, and I remember that B. asked me the name of the plant. Dear me, what was that name? A very happy day that was. We drove from Buxton. I don't remember that part of the drive, except that old D. told us twice in the course of it his old story about the witness and the judge. But I remember very well the "Peacock" at Rowsley, for I had been there before, and I remember the drive through the meadows by Haddon Hall to Bakewell. Ah, yes! in the inn yard at Bakewell there was a cat torturing a mouse, and I remember how indignant I was with the brute. Odd that I should recollect a little incident like that, when I cannot remember the name of the cactus! What was that name? Poor old D. He is dead now. How cold it was when we started from Euston to go to his funeral, and E. dropped his umbrella between the train and the platform. The name of the cactus! It began with a "C," or was it a "G"? And it had an "m" in the middle, or at any rate it had no letter with a head or or a tail, and I think it ended with "s"—Cinereus? No, Gamens? No. Stay, had it not something to do with wax? Or was it that there was a *Hoya carnosa* close by? No, there is some flavour, some suspicion of wax or bees about it. Ap—no, it began with a C. Cim—Cam—Cer—Ceraceus—*Cereus!* That was it! Of course! Cereus, and hence the suggestion of wax—cera. Such were the rambling memories brought up in my mind by the sight of the cactus. Let us now examine the course of the reminiscence.

The memories that occur to me in this train of recollections fall naturally into three groups, not by any means distinct from each other, but well enough characterised in type, though grading off into the others at their margins. When I saw the cactus, the memory of the other cactus of the same species at once presented itself to my mind. I took no active part in the process; it was forced upon me, and at once claimed and obtained my attention. The attention given to it

was a purely reflex attention. The scene—the hothouse, with the pots standing in their bed of broken stone, and the plumbago hanging from the roof, the damp tiled floor, and the group of companions standing up and down the passage, the babble of voices—all comes before me without effort of my own. It breaks in upon me from without, and captures my attention will I, nill I. But this phase soon passes off. As I go wandering along in the other reminiscences, my attention is solicited, but not commanded. When I saw the cactus, I could not help thinking of the Duke's greenhouse, but the "Peacock" and the drive to Bakewell I brought into my mind by a voluntary effort. The attention is partly attracted reflexly by the presentation of the memories, but partly also I am actively exerting my attention to follow the train. In particular as to that little incident of the cat and the mouse in the inn yard, the solicitation is minimal. The presentation is but faint, and it occurs at the margin, as it were, of the field of consciousness, and, in order to drag it forward and put it in the full light, a distinct effort of activity is necessary. The effort is not deliberate. It is the outcome of no conscious and definite volition; but still there is a certain very recognisable exertion of activity, a turning of the attention to the presentation before it becomes clear and accented as a prominent constituent of consciousness. When I am searching for the name of the cactus, this active element in the mental process rises into much greater prominence. There is no command, no solicitation even, of the attention, by the memory presentation, for the memory presentation does not exist. It is not a case of a presentation at the margin of the field of consciousness being dragged into the focus of mental vision: it is not a case of a faint presentation being vivified and brightened by turning the glare of attention upon it. It is a case of activity of the self as a *causa immanens*. The attention comes back, as it were, from going to and fro in the field of consciousness, and from walking up and down in it. It comes back like the dove into the ark, having found no rest. It goes out spontaneously, it searches and probes hither and thither, and all without effect. And at length when the result is attained, when the right memory at last arises in consciousness, it does not appear to be a result of this active process at all. It is not after all dragged into consciousness; it presents itself spontaneously. It comes in in obedience to no call, but under the operation of causes that are outside consciousness altogether. The process of searching and probing may assist the process of recovery, but we have no direct

evidence that they do so, and very often the recovery at last takes place after the search has been abandoned as fruitless. We have exhausted every effort to peer into the darkness and discover what we know is lying hidden there, and after we have given up the attempt the object may appear before us. What is the rationale, what the significance, of these three modes of the mnemonic process?

At the sight of the cactus, the memory of the appearance of the other cactus arises in my mind. The one reminds me of the other, and if I ask myself why and how the one reminds me of the other, I am obliged to answer—by its likeness. The appearance of the one calls up the memory of the other, because they are alike. It is an example of what has been called, since Hartley, Association by Similarity. But why does a state of mind call up or suggest another state to which it is similar? What is the link which binds them together, and allows of the one dragging the other after it? My explanation would be that, in as far as the two states of consciousness are alike, in so far they accompany activity of the very same elements in the nerve tissue; that the structural memory, left by the impression of the first cactus, again becomes an active memory when an impression is made by the second; and that in so far as these impressions were alike, the states of consciousness were identical. But it is evident that this explanation goes too far. If the tissue now active is identical with the tissue formerly active, and if the states of consciousness also are identical, then there are not two states of consciousness, but one. There is not a percept which recalls a memory, but a percept only. But this is not the case. In addition to the percept of the plant before me, I have a distinctly separate and additional consciousness of the other plant, and when I seek to determine the differences between the two states, I find that I can discriminate three. In the first place, the percept contains presented elements, and is therefore a much more vivid state than the memory; but this difference alone is not sufficient to enable me to discriminate them, for, in the absence of other differences, the two would be fused together into a single percept. In the second place, the two percepts were not precisely the same, and some of this difference may still be discernible between the present percept and the memory. The first plant may be remembered as distinctly larger or smaller, or in other ways different from the second. But it is obvious that, in as far as the plants are different, the remembrance of the first is not founded upon similarity. In other words, when the impression

of the second plant is received, it is received in the same area of tissue as was the impression of the first, and this area of tissue becomes active. But the two areas do not precisely coincide. There are features in the present impression that did not exist in the first; there were features in the first impression that do not exist in the present. But when the memory of the first impression becomes active under the provocation of the second, the activity of the memory is not confined to those portions of tissue in which the impressions were identical, but spreads beyond to other portions that were simultaneously active, or, as we may put it, were parts of the original memory; and this brings us to the third difference. When the memory of the former plant is revived in consciousness, it is not revived alone, but a large part of the then field of consciousness is reinstated along with it. I remember not only the aspect of the plant, but a large part of its surroundings also—the bed of broken stone on which it stood, the plumbago overhead, and the other accessories that have already been mentioned. Now, there is no similarity between the bulk of these memories and the impression that I am now receiving. Their presence in consciousness corresponds with activity, not of the portions of tissue now excited by the present impression, but with the irradiation of this activity to portions that were formerly active at the same time. The reinstatement in consciousness of one portion of a memory involves the partial reinstatement of the rest. The revival of one portion of a field of consciousness does not take place as an isolated process, but drags in along with it the revival of other portions of that field. This is what is known as Association by Contiguity, or rather, it is one form of Association by Contiguity, the other form being the reinstatement, not of other parts of a coexisting field, but the reinstatement in succession of states of consciousness that have before succeeded each other. Upon further consideration, however, these two forms of contiguity may almost be resolved into one, for although the field of consciousness at any moment includes many coexistent states, the states which are revived in memory as having been coexistent, are states to which attention was directed successively—in alternating succession, it is true, but still successively, and so are rather cases of succession than of simultaneity in consciousness. The problem of Association by Contiguity is therefore to explain how it is that states which have followed one another in their original occurrence, follow one another in their revival. As far as introspective psychology is concerned, this succession is, like the

revival of similars, an ultimate fact. If we say that their original occurrence in succession, or that the movement of attention from one to another, creates a bond or link between them, so that the one drags up the other, we are offering an explanation that is purely verbal, and is no real explanation. But if we have regard to the underlying neural states and processes; if we regard the succession of conscious states as the succession of activity of nervous processes; and if we regard the substitution of one state for another as the transfer of motion from one area of tissue to another; then there is neither difficulty nor improbability in supposing that this passage of motion opens a channel between the one area and the next, such that when the first area again becomes active, the motion flows from it to the next as freely and naturally as the water in a cistern pours out when the syphon is full. And in this case the explanation is more than verbal. It brings in aid the fundamental property of living tissue that has been described under the head of dynamical memory, and shows that if such a property is indeed resident in nerve tissue, then on the physical side Association by Contiguity follows of necessity. By Association by Similarity we understand, therefore, the revival of a state of consciousness not similar to, but identical with a previous state; and we speak of it as similar and not as identical, because it is associated by contiguity with elements that are different from elements in the reviving state. And this revival of an identical state we suppose is due to the renewal of activity in an identical area of nerve tissue. On the other hand, we regard Association by Contiguity as the repetition of a succession of states of consciousness; and this repetition of succession we regard as concomitant with the transfer of motion in paths opened up by a previous transfer.

So far, then, we have accounted for the revival of these conscious memories in the order and connections in which they appear. But something has yet to be said as to their relations to Attention, by which they were divided into groups. As to the first two groups, we see that their relations to attention are precisely similar to those of Percepts. A percept may be so vivid, may be so emphatically and strikingly presented, that it compels the concentration of attention upon it; and the same we have seen is the case with a memory. Or, on the other hand, the presentation of the percept may be so faint, or it may be so far removed from the focus of consciousness, that it can scarcely be called a percept at all. It solicits attention so gently and

gingerly that it scarcely merits the title of a presentation; and yet if attention be actively fixed upon it, it at once becomes a prominent, becomes *the* prominent, feature in consciousness. The same is the case with the collateral memories that cluster about the memory of the cactus. When this memory is revived, they also are revived, but in much fainter degree. They are there, they are before one's mind, they are in consciousness, it is true; but they are so little prominent, that, unless attention is concentrated upon them, and they are intensified in the process, they may subside without their presence having ever been manifest. In this case, the chief share in the process of reminiscence seems to be taken by the attention; or, at any rate, it is clear that there is here an active element in the process; that towards the composition of the process there goes, not only a presentation to the subject, not only a reflex activity of the subject, but a spontaneous activity of the self, without which the conscious memory would scarcely exist.

In the third case there is yet a further difference. While I am groping in the recesses of my mind for the name of the cactus, there is no presentation at all to which the attention is attracted. The activity of the self is not elicited at all, it is spontaneously exerted. It is put forth in the hope and with the intention of finding the appropriate presentation, upon which it may fix; but as yet in the absence of the presentation. If this process has an analogue in perception, it is when the attention is wandering over the field of presentation to find some percept which as yet is not identifiable, as when we listen for a single voice in a chorus, or try to see the land which is not yet in sight.

It has been held that, before the attention can be thus exerted upon the recall of a conscious memory, there must be something in consciousness for it to be exerted upon. That there must be some adumbration of the memory already in consciousness, even if only subliminal, or there would be nothing to arouse attention. There would be not only no memory for attention to fix upon, but there would be no *raison d'être* for the exercise of attention. Especially when there occurs the feeling of having almost recalled the memory, when we feel that Bain calls the "twitter" of it upon the tongue, but cannot actually enunciate it, it is said that there is, in fact, an actual revival of the memory somewhere; and it has been suggested that the active memory which underlies this subconscious revival takes place upon one side of the brain which is devoted to this purpose, and that the activity is transferred to the other hemisphere when the actual

revival takes place. I cannot see that there is either ground or necessity for this doctrine. Supposing that we never knew the name of the cactus, we could still infer from experience that it had a name, and could set forth to seek that name in the certain absence of any such subliminal consciousness; and equally, I think, can we set out to remember it. What happens, as it seems to me, is this. From experiences such as the cat-and-mouse remembrance, we know that in the field of consciousness there are presentations of extremely faint intensity, of whose existence we are scarcely aware, some would say that we are not aware, until attention has been concentrated upon them. When the need of reviving a memory, such as the name of the cactus, occurs, then attention starts out to search the field of consciousness, in the hope that peradventure the memory may be lurking in some obscure corner, and may be found and dragged into light. In the case supposed, a fragment of it was found. I could remember the general outline of the written name, though I could not remember the specific letters or syllables of which it was composed. There was a roundish capital at the beginning, followed by a tail of letters of uniform height and of uncertain length, but the further details I could not recall. I got at these indirectly. As attention was playing round the shape and sound and meaning of such of the name as could be recalled, there came into consciousness an idea of wax, and it was through this that I eventually reached the completion of name Cereus. The idea of wax once being in the mind, the transition to Cereus takes place by contiguity in the manner already examined. But how does the idea of wax arise just at this convenient juncture? By contiguity again. When I orginally learnt the name Cereus, knowing the deficiency of my verbal memory, I cast about for familiar ideas to which I could attach it, and I fixed upon its similarity to Cera, and carried my attention backwards and forwards between Cereus and Cera in order to establish a connection between them, so that the presentation of one should call up the other. And this is what happened. The dim and imperfect presentation of the name Cereus, together with its associated states, of the appearance of the plant, etc., brought up the idea of wax, which again brought up Cera, and so took me to the completion of Cereus.

Thus we find that the voluntary revival of a conscious memory comes about by the passage of attention from one object to another which has followed it on a former occasion. It is the repetition of a sequence of

attention. The attention may be purely reflex, or it may be purely voluntary, or it may be of any intermediate grade; but, in any case, the revival of a conscious memory is the repetition of a sequence of attention. The attention follows a path that it has pursued before. If that path is maximally permeable, the attention is reflex, and the revival of the memory automatic and independent of the will. If the path is scarcely permeable, volition takes a leading share in finding the route for attention to follow. In any case, the process of revival of a memory is the movement of attention, and is easier as the path from the reviving state to the state revived is more permeable. The notion of a path implies a certain distance or interval between the things that it connects, but no such distance or interval is meant to be implied in what has been said. We may therefore substitute for this expression that of the cohesion of the states which revive and are revived, the states between which the attention passes, and which successively are revived in memory; and we may say that the ease of revival depends upon the degree of cohesion between the antecedent and the consequent state. But the degree of cohesion of two mental states is shown in another section to be a measure of the degree of belief; and in this there is nothing inconsistent. If I remember two events in sequence or two states coexisting, and if the memory of the sequence or the coexistence is extremely vivid, and is presented with such prominence and force as to capture my attention, and compel me to contemplate it; then that is as much as to say that I strongly believe that those events did occur in that sequence, that those states were coexistent in my experience at the time to which I refer them. If, on the other hand, the revived relation does not thus thrust itself into consciousness, but has to be searched for and brought in by a voluntary effort; as the memory is less importunate, so the belief is less firm. That relation that I can now reinstate only with difficulty, I am not so certain about as I am about the other. Reminiscence or recollection, with which we are now dealing, is a process, and the results of this process are in one aspect memories and in another aspect beliefs; and here we are again brought face to face with the community of origin and of nature of mental states that we are in the habit of considering separate.

Be that as it may, the ability to revive a memory, the facility with which the attention can reach it and bring it up into the full light of consciousness, depends upon the connection between the present

content of consciousness and the state which it is desired to revive; and by connection is meant the path, union, link, adhesion, or nexus left by the previous passage of attention from the one to the other. As already explained, this is what is meant by Contiguity. In order that a memory may be revived, there must have been a previous transfer of attention from some state now in consciousness to the state to be revived. We have already seen, in the case of the name Cereus, that this link between the two states need not of necessity be direct. It is sometimes more cohesive when it is indirect, and when the attention has to proceed by a circuitous route, as when Cereus is identified through the medium of wax and cera. It is now to be observed that the strength of the cohesion between two conscious states is determined, not only by the tenacity of any single tie between them, but also by the number of ties. A number of threads may be as strong as a single cord, as Gulliver found; and if two states are connected by numerous associations, even if each association is individually weak, the resulting cohesion may be as complete as if they were connected by a single direct and powerful link.

Here are two plants, whose names have been associated with their respective appearances about an equal number of times in my experience. The name, Sanguinaria, of the one, I have no difficulty whatever in recalling. It arises in my mind spontaneously and certainly whenever I see the plant. But the name, Eomecon, of the other, I have always a difficulty in remembering. Often I see the plant, and am unable to recall the name. If I have not seen it for some months, I am sure to forget it. Though I have seen the name of the one as frequently and as recently and as vividly as that of the other, I do not remember it so certainly nor so readily. What is the cause of this difference? The cause is, that between the one plant and its name Sanguinaria there are many paths of association. Between the other and its name Eomecon there is but one; and although the direct path is equally permeable in the two cases, the existence of collateral paths so strengthens the cohesion in the one case as to bind the two states of consciousness firmly together; while their absence in the other leaves but a single tie between them, a tie which is not strong enough to ensure the transition from the one to the other. In both cases there is the direct association of hearing and seeing the name while examining the plant; and in the case of the Eomecon this is the only association between them. But in the case of the Sanguinaria there

are many additional associations. The colour of the roots is the colour of blood, and this leads directly to the name. This name has also many associations with other conscious states. It is associated with sanguinary, and so with battle, murder, and sudden death. It is associated with sanguineous, and so with another series. The first part of the name suggests anguis, a snake, and leads to the thick, contorted roots. The second part suggests area, and the denotation of that word. It is not contended that all these states of consciousness arise clearly, prominently, or vividly before the mind when the name Sanguinaria is uttered; but that some or all of them are called up, faintly it may be, dimly and confusedly, but still they do to some extent arise in the mind, and do become associated with all that is then in consciousness; that is to say, with the appearance of the plant on the one hand, and with the name on the other. So that when the plant is again perceived or thought of—when the appearance of the plant is again present in consciousness—there is a tendency for some or all of these states to follow that appearance. And all these states are connected at one end, as it were, with the appearance of the plant and at the other end with the name; so that each of them forms a separate thread of connection, tending to make the name follow the appearance of the plant into consciousness; tending to strengthen the association between them; tending to drag the one irresistibly after the other. Each thread may be delicate and fragile, but the combination of them is able to exert an appreciable traction. Thus the number of associations of a state of consciousness is an important element in its revivability.

In reviewing the physical process by which structural memories become active, we found reason to believe that there were two modes of this initiation. One in which free motion was communicated from without, and one in which unfree motion was accumulated within, until it exceeded the power of the controlling agency, and became free. Correspondingly, from the interrogation of consciousness we discover that memories may be aroused in the ways which have just been described, and in addition to this mode of revival, that they may arise spontaneously and without any discernible provocation or attraction by anything previously present in the mind. Already one instance of this unsolicited revival of a conscious memory has been instanced, in the appearance of a name after the search for it has ceased; and we have now to notice that the occurrence is not an infrequent one when there

has been no antecedent search, no apparent connection with, suggestion or solicitation by, anything present or recent in consciousness. While I have been writing these lines, in the intervals of the attention given to the subject-matter, I have had thrust gently upon me the memory of a walk I took at least fifteen years ago. The scene has come before me, the shapes, names, voices of my companions, a scrap of conversation, the mention of a man named Quait. What has brought this memory before me at this time I am utterly unable even to conjecture. No part of it had any connection or association with anything that was passing in my mind when it arose. It came in *ab extra* and presented itself, not with any great prominence or strength, but with enough to solicit gently my attention; and in this way multitudes of memories occur to me. Sometimes they are attended to and detained for a while; some attain considerable prominence and start trains of reminiscence; but for the most part they rise scarcely to the surface and subside again without having engaged the attention. I often compare them to flakes of bran in a pot that is warming on the hob. They rise out of the depths, they float for a while, and they subside into the depths again. They are like fragments of weeds floating down a stream, they come up to the surface, not dragged up by any hook and line of association, but *mero motu;* and having been visible for a few moments, they sink again out of sight. I suppose that everyone is familiar with this occurrence of disconnected memories, though I daresay they are more frequent and more conspicuous with some than with others; but I have not met with any account of them in the books. In everyday life they are not of much importance, but I think that they are of considerable importance as affording the normal counterpart, not only of dreams, but of serious pathological states.

FAULTS OF MEMORY

Under this heading are included anomalies of all the forms of memory dealt with in the last section, as well as of remembrance, and brief notice must be taken of each.

For a structural memory to fade, weaken, and diminish has been shown to be in the normal course of events, and in this way, owing to the elasticity of nerve tissue, all structural memories, at any rate all that are not frequently exercised, are continually undergoing diminu-

tion. But apart from this gradual and normal process, structural memories may be lost in two other ways. If a portion of brain tissue is destroyed, either by violence or by disease, the structural memories that it contained are of course destroyed along with it, and the corresponding active and conscious memories are for ever lost. The most dramatic instance of such a destruction of structural memory is seen when Broca's convolution is damaged. The structural memories of articulatory processes are then destroyed, and the result is aphasia. But this is by no means the sole instance of such amnesias. When other portions of the cortex are destroyed, other structural memories are destroyed in them, and portions of the mental life are lost. In the frequent case of congenital destruction of convolutions around the Rolandic fissure, the inherited memories of movements of the arm or leg are lost, and these movements remain for ever unattainable. Not very infrequent are cases in which the same convolutions are invaded by morbid growths, and then we witness the loss of memories that have been acquired.

The second way in which a structural memory may be destroyed does not, as far as we know, involve any "gross lesion" of the brain substance, any actual disintegration of tissue. It seems that, upon its formation, a structural memory is a very frail affair, and that it needs a certain lapse of time, and especially it needs the intervention of a period of sleep, to give it consolidation and a quasi-permanence. At any rate it is found that after any great physical shock, after a fall or blow upon the head, sufficiently severe to produce unconsciousness, the most recent structural memories are obliterated, so, that when consciousness is regained, a period of variable duration immediately preceding the injury is an utter blank. There is a normal remembrance of events that took place up to the onset of sleep the night before, or up to several hours, or it may be an hour, or a few minutes, before the injury; but the chain of events that are remembered does not extend up to the moment of the injury; it stops short some time before, and of the period of active conscious life intervening between this moment and the moment of the injury, no conscious memory is ever possible, because, as we suppose, the structural memories are all obliterated by the violence of the concussion. It appears as if the shifted particles, as yet unsettled in their new positions, were shaken back into their former place.

In such cases the structural memory produced by, and corresponding

with, a certain experience, is wanting. In the converse case a structural memory is formed, not under the influence of any experience between the organism and its surroundings, but by the autogenetic working of the brain itself. Such an event would be an instance of the unconscious "cerebration" that has already been referred to, but it would become known when only the structural memory became active and attended by consciousness. Then if it were not erroneously localised in time or space, it would contain nothing abnormal. Only when erroneously localised would it be morbid, and it is better therefore to defer its consideration.

The normal variations in Dynamic Memory are very wide. The number of repetitions of an experience necessary to confer an enduring "set," the degree of attention, etc., required, vary very widely within the normal; but neither of this nor of Active Memory is it necessary to discuss the anomalies separately in a work on psychology, since we are primarily concerned with Conscious Memory only, and with the other forms only in as far as they throw light upon the occurrence of conscious memory.

In the examination of normal conscious memory, it was shown that the memory of a conscious experience differs from this experience in two respects, viz. it lacks an element which the experience contained, it contains an element which the experience lacked. In both respects error may exist in the memory.

The memory may contain all the elements which were present in the original experience. Supposing that this original experience was a percept, say a visual percept of a cat; then when the percept is remembered, it reappears in consciousness as a percept, in all its original vividness, intensity, and reality; and instead of merely "remembering" the appearance of the cat, the animal is actually seen as though it were present. In this case the disorder is termed hallucination.

Or the memory may lack either of those additional elements which have been described as differentiating it from an original experience. It may lack either the localisation in time, or the localisation among contiguous experiences, both of which are needed to constitute it a complete memory. A memory may appear in consciousness, but, from absence of that reference to past experience which is an integral constituent of every complete memory, it may not be known as a memory, but may be regarded as an original experience. It is not

uncommon, it is at any rate an occurrence to which I am peculiarly liable, for a conclusion to be reached, apparently *de novo*, as an original thought, which is in fact but the memory of a conclusion previously attained by original thought, or acquired by reading. The memory arises in the mind, but, for want of reference to past experience, it is believed to be a conclusion attained now for the first time. It has several times occurred to me to make a note in my commonplace book of some idea which I had just thought out, and to find the entry of the same notion staring me in the face upon the same page. I do not doubt that many instances of plagiarism are quite unintentional, and are due to a similar absence of the reference of a memory to the past experience of the original state. I have myself, in answering a letter not actually before me, plagiarised in this unintentional way a thought in the very letter I was answering.

Without being wholly absent, as in the cases just instanced, the reference to past experience may be defective, vague, indefinite. We may recognise that the memory is a memory and not an original experience, but still we have but the vaguest estimate of the time that has elapsed since this original experience took place.

Still more common is the defective localisation of the memory among other memories—of the original experience among other experiences. "Where have I seen that face?" is an expression that we have most of us had occasion to use, and that expresses the defect in question. We recognise a phrase, or a verse, that occurs to us as the memory of one that we have read, but we cannot localise it in its proper context; we cannot remember in what book we have read it, nor who is the author. We are working at some subject, and we remember having met with a fact, a description, a record, which is just to the purpose, and would serve as a valuable illustration or corroboration; but we cannot localise it among the experiences in which it occurred. We cannot remember where we read it, or from whom we heard it. We may remember an event as having occurred on one of several occasions, but we cannot localise the precise occasion. I first met Jones either at Smith's, or Brown's, or Robinson's, but I cannot remember which.

In the same ingredients of memory, error is almost as common as defect. How often are we not surprised to find by reference to records, how long it is since this event happened, how recent is that experience which seems so long ago? And similarly, how often are

we not convinced that an event happened in one set of circumstances when in fact it happened in another; that Jones and not Smith was the patient that we advised to go to Egypt, or that Davos and not Cairo was the place that we recommended; that we had that piece of information from Brown when in fact it came from Robinson; that the shop we want was in East Street when in fact it is in West Street?

Defective reminiscence is one of the commonest of mental events. Nothing is more common than the inability to recall, when it is needed, some memory that we know that we possess. A word, a name, Cereus or Eomecon, for instance, a melody, some succession of muscular adjustments, the way to tie a particular knot, to take to pieces a complicated machine, is known to be among our acquirements, but we cannot produce it when called upon. Here we are at once met by a difficulty. How is the absence of a memory known? A presentation or representation is part of our consciousness, part of our mental life; it is in the mind; it is before the attention; but what part of our mental life is a memory which, for the time being, does not exist? How do we come by, how do we hold, the knowledge that there is something which ought to be, but is not, in our mind? In this way. The memory of any concrete thing, or orderly process, is an organised whole, resembling in its organisation many other such complex states; and, among the members of every such organised memory, the name is a constant constituent. When such a memory is revived, it is revived, not as an amorphous cluster of adherent states jumbled together anyhow, but as an orderly complex with all its constituents disposed in due relation with each other. It is easy to see that in such a case any one constituent may literally become conspicuous by its absence. If we take an alphabet of letters, printed each upon a separate ivory square, such as children are fond of playing with, and dump them all down in a heap on the table, the absence of one or two would not be noticed; but if the letters are arranged in their order from A to Z, and one or two are then abstracted, their absence is one of the most conspicuous features in the presentment. It is, I take it, because our mental acquisitions are not random accumulations, but orderly arrangements, that the absence of a single constituent, such as the name, becomes a prominent feature in consciousness.

But in many cases, I think that the missing memory is represented in the mind not as a complete blank, but as a vague shadowy ghost

of the absent member of the group. The memory is extremely imperfect, but some memory is revived. In the case of the name Ceres, for instance, there is some adumbration of the shape of the written word; there is some echo of the sound of the spoken word; there is some revival of its associated meanings, as of bees and wax; but some very incomplete memory there is, and what is wanting in its completion.

Be this as it may, we must recognise that there is a defect of remembrance which is felt and known, in which the wanting memory is known to be wanting, is sought after and striven for with effort that is sometimes painful in its intensity. We have next to notice that there is also a defect of reminiscence in which no such want is felt and known. The memory fails to be revived, and we go on regardless of its absence. It is explained under Volition that, when we have a distant end in view, we sketch out an arrangement of the several steps of conduct by which this end is to be attained, and having made our sketch, we drop it, as it were, into the memory, and think of it no more, depending upon each step, whenever it is executed, calling up by association the memory of the next in order. I have to keep a dinner engagement, for instance, and in the morning I sketch out my plan. I must go up to dress at a certain time, I must catch a certain train, and take a cab from my station of arrival. This sketch of procedure remains as an organised and coherent memory. Each step, as it is carried out, brings up by association the next; and thus, after the course is once determined upon, it is carried out with a minimum of interference or regulation by attention. But this sequence of reminiscence sometimes fails. One operation suggests another in due series up to a certain stage, and then comes a blank. This is a lapse of memory to which some people are particularly subject. An apt quotation occurs to me, and I arrange in my mind to go to another room, get the book from its place in the bookcase, and look out the passage. But when I get to the other room, the sequence fails. I stand there and wonder what on earth I have come for, and often have to go back without effecting my purpose. Or the sequence may proceed sufficiently far to take me to the bookcase, or even to select the volume, and then it fails, and I can get no further. If an unfamiliar operation has to be interpolated in the course of a familiar sequence, I am almost sure to forget it. I frequently go to town and visit the same round of places, ending by going to my club and reading the magazines till dinner. More than once it has happened that when I have pre-

arranged to fit my lecture into this course of proceeding, I have gone through the usual routine, and spent, over magazines at the club, the hour that ought to have been occupied in delivering my lecture; and now I do not venture to visit any of my familiar haunts on lecture days.

A very important question arises here as to what degree of defect of memory is to be considered morbid. The range, within the normal, of ease of acquisition, of faithfulness, completeness, endurance, and recoverability of memories, is enormous; and it is very difficult to erect any quantitative standard such that, if that standard is reached, memory is not morbidly defective, while if it is not reached there is morbid defect. So extremely wide are the limits of normal memory, that it would seem as if there might be great practical difficulty in determining the existence of morbid defect. In practice, however, no great difficulty is experienced, for it is tacitly agreed that no defect shall be regarded as morbid which is not extreme. The phrase "total loss of memory" is not an uncommon one, even in official documents, but it is very manifest that a total loss of conscious memories can exist in total unconsciousness only, and that so long as there is consciousness, part of this consciousness is made up of memories. Even in the deepest dementia is still retained the memory of the differences between self and not-self, between up and down, between arm movement and leg movement. Beyond the thoroughly organised common memories of this class, there are memories peculiar to the individual which everyone retains as long as his mind is sound, and loss of which is certainly morbid. Every man remembers the way in which he earns his livelihood; the approximate amount of his income; the locality in which he lives: the way about his own house and place of business. Every married woman remembers the scene of her marriage, the dress she wore on the occasion, the circumstances of her confinements, the names of her children, and so forth.

Reminiscence, especially reminiscence by suggestion, may be excessive in several ways. It is very common to meet with persons who cannot tell a plain tale, who cannot keep to the straightforward course of a narrative, but are diverted hither and thither by every passing suggestion. Mrs. Quickly, Juliet's nurse, and Miss Bates are cases in point, but cases within the normal. Bordering upon morbid excess is the case of the man who goes to his bedroom to dress for dinner, and, having begun to undress for this purpose, completes the operation

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...NORMAL AND MORBID

...given by the man who has ...starts from his office in the ...previous home; and all cases of ...in the same category. It is ...reminiscence by suggestion ...considered even the main, disorder. ...but a relative excess only. That is to ...is normal, it is the occasion only which ...nature of over-action from loss of ...forward because it is not interfered with; ...to divert it from its beaten track, and ...rather than the excess of suggestive reminis-

...is often witnessed in those old people who ...gerated degree that "loss of memory for recent ...known to be a characteristic of old age. The ...senility is rendered evident by a difficulty in ...especially names of recent acquisition; and the ...defect of age is the inability to recall memories ...a defect which is the more conspicuous from ...capacity to recall the memories of experiences long ...evidently not in the process of reminiscence, but ...structural memories. There is no difficulty in ...existing structural memories; what is lost is the ...which allows of a structural memory being formed; ...where there is no structural memory, reminiscence is ...Along with this defect in the formation of structural ...frequently goes an excess of activity of those memories ...long-past experience. Not only are these memories ...they are recalled with exaggerated frequency and vivid-...memories of boyhood, for instance, are not only retained, ...reproduced with excessive frequency, and with a vividness ...middle life was unattainable. We often witness, in the ...old age, that not only are the experiences of the day ...not only are the experiences of youth remembered, but the ...youthful experiences thrust themselves forward with such ...and persistence that they become the dominant feature in ...and the old man literally lives his youth over again. ...degree does this vivid reappearance of memories attain,

that it sometimes invades the province of perception, and the veteran addresses his grandchildren by the names of schoolfellows of his own who have long been dead, and with whom he has had no dealings since his boyhood. It seems as if structural memories were laid down in the nervous system in strata, the memory of each successive experience overlying the memories of previous experiences; and as if, in senile loss of memory, the removal of the upper layers allowed of an over-activity of those that remain, on the principle so familiar to neurologists under the name of "loss of control." If we agree to the extension of the meaning of memory that is here suggested, and make it include both structural and active as well as conscious memories, it would seem that such an interpretation is justifiable; that such excessive reminiscence as has been described is parallel with that excessive activity of automatic and habitual acts with which neurologists are so familiar; and that both may be ascribed to over-activity of nerve tissue, due to loss of the control that has been exercised by nervous arrangements of later acquisition, now lost by denudation.

Another instance of excessive reminiscence by suggestion is exhibited in some of the ravings of mania, and especially in verbigeration. The ravings of mania are often called incoherent, when what is meant is that they are inconsequent and inappropriate, but in many so-called incoherent ravings a train of association can be easily traced.

In these excesses of reminiscence the influence of association is often inconspicuous and difficult to trace. There are others in which it is altogether absent. In the account of normal revival, mention has been made of the sporadic appearance of disconnected memories, which present themselves independently of any discernible association with states then existing in the mind. It is in excess of this form of reminiscence that, in my opinion, is to be found the source of many of the puzzling occurrences of mania, and the foundation of many of our dreams. Very much the same condition is experienced in obsession (which see). In this condition a memory of excessive intensity continually obtrudes itself. It will not be dismissed nor superseded by other states of consciousness, but pertinaciously recurs, and maintains its ascendency. From the present point of view it is evident that this condition may be regarded as excessive reminiscence.

Error in reminiscence is almost as frequent as defect. We search for one memory, and we find another; and we may or may not recognise

that there is an error; and in this as in other errors, the difference between normal and abnormal error, between mistake and delusion, lies in the ability to correct the error when the means of correction are furnished. The error that is then incorrigible is morbid. I am talking to a man named Butcher who lives in Baker Street, and I call him Mr. Baker. I may or may not recognise the error as soon as I have made it, but in any case, if my mind is normally constituted, I recognise the error as soon as my attention is called to it. But if, after explanation is made, I still maintain that his name is Baker, the error transcends the limits of the normal, and becomes a delusion. In verbal memories, this form of error attains its most exaggerated degree in certain cases of aphasia, in which the misapplication of words is the most prominent sign. In these cases, as in that just instanced, the speaker may be aware of his error and may be able to correct it when the proper word is furnished, or he may fail to recognise that there is anything wrong with the expression. Thus, one aphasic designated the sun by the title "cubical feet," and, instantly recognising his error, called himself a "loof" for making such a mistake. Another told me that her husband, a marble polisher, was a "marble labentine," and evidently thought me very stupid because I did not understand her. In the former case we must suppose that some very incomplete but faithful memory of the name survives, and that comparison is made, and disagreement recognised, between this memory and the name that is revived. In the latter case there would seem to be no memory at all of the true name.

The same form of error occurs in other departments of experience than that of nomenclature and verbal utterance. A patient, suffering from dementia due to alcohol, had a struggle in a carriage, in the course of which his finger was dislocated. A few days afterwards, on being asked how the injury occurred, he gave a detailed account of tripping on a loose stair-carpet, falling forwards, and dislocating his finger by striking it on the edge of a stair. Either he had actually met with such an accident on a previous occasion, or he had imagined such an occurrence as a possible origin of his injury, and when he was called upon to produce the memory, he brought up the wrong one. Such erroneous reminiscence is very frequent in insanity, and in other allied states. It is the basis of many of the accusations of ill-treatment that are made not only by insane persons, but by hysterical girls. To multiply instances is unnecessary, for we are all of us but too familiar with the

fact that reminiscence may be erroneous; and the difference between a mistake in remembrance and a mnemonic delusion is that the one is corrigible when the means of correction are at hand, while the other remains incorrigible in the face of contradictory evidence.

From the point of view which regards perception as the addition, by suggestive association, of a cluster of memories to a sensation, it is evident that illusion may be regarded as erroneous reminiscence. The sensation calls up a wrong group of memories, and these memories, when incorporated with the sensation in an organised whole, constitute an erroneous percept, which, if the error is incorrigible, is an illusion.

PLEASURE AND PAIN

It has been pointed out in the introduction, that every interchange of motion between the organism and its surroundings has some effect on one side or the other of that secular conflict by which the former maintains itself against the disintegrative influence of the latter. The life of every organism is a cycle of conflict between integrative and disintegrative processes—between those which lead to a higher, fuller, completer life, in which more accurate adjustments are made to more extended circumstances; and those, which, when at last triumphant, end in death, to a less accurate adjustment to narrower circumstances. In the morning of life, the integrative process, the process of development, the process of evolution, has a vast preponderance; and the organism increases at once in bulk and complexity of structure, and in the accuracy and extent of its adjustment to circumstances. As life continues, the integrative process slackens, falters and draws to a close, while dissolution and disintegration gain a preponderance that steadily increases, and at last reduce the efficiency of adjustment to a point that is no longer compatible with the continuance of life.

This aspect of the commerce between the organism and its surroundings has, as all aspects of that commerce have, a corresponding element in consciousness; and as it is the most important aspect of the interchange of motion between the organism and its surroundings, so its mental counterpart is the most important factor in our mental life. The integration or disintegration, the gain or loss, the degree of success or failure, of the organism in the struggle for life, is mirrored in our

consciousness in the tremendous experiences of pleasure and pain. Pleasure and pain are the mental accompaniments of experiences that are respectively beneficial and harmful. An experience that is pleasurable is *ipso facto* beneficial; an experience that is painful is *ipso facto* harmful. A moment's consideration will show that this must be so. If we imagine that a different state of things ever existed, it will be manifest that such a relation of affection to experience could never have endured, but must have rapidly altered into that which we find now to exist. For pleasure and pain are the guides to conduct, and supposing that they accompanied, indiscriminately, experiences that were beneficial and harmful, this guidance would rapidly bring about a readjustment. Beneficial or harmful, the pleasurable experiences would be sought, would be dwelt upon, would be continued and repeated. Harmful or beneficial, the painful experiences would be shunned, would be abbreviated and evaded. So that, if the pleasurable experience were harmful, the beings thus affected would rapidly perish; while those who found pleasure in beneficial experiences would soon prevail with immense preponderance. If harmful experiences were pleasurable, the beings so affected would seek with avidity their own extinction. Seeing how keen has been the struggle for survival throughout the whole of the animal kingdom in all its history; how trifling the factors that have often determined survival or extinction; the very fact that any form has survived, and is still in existence, is incontestable proof that the two affections of pleasure and pain have in it become equilibrated to the two opposite effects of the interchange of motion, and that in it pleasure corresponds with beneficial, pain with harmful experiences.

An approximation to this doctrine was reached by Dr. Bain in his formula that "States of pleasure are concomitant with an increase, and states of pain with an abatement, of some or all of the vital functions." To this Mr. Grant Allen objects that, with regard to pain, it is too vague and too general, but is otherwise correct as far as it goes; while as regards pleasures it is open to more serious objection, and he states, as what he believes to be the true principle of connection, that "Pleasure is the concomitant of the healthy action of any or all of the organs or members supplied with afferent cerebro-spinal nerves, to an extent not exceeding the ordinary powers of reparation possessed by the system. . . . In short, it will be seen that while Professor Bain refers Pleasure to an *increase* in the efficiency of the organism, it may better be

regarded as the concomitant of a *normal amount of activity* in any portion or the whole of the organism." With this statement of Grant Allen's I should not be disposed to quarrel. His conclusion has been generally adopted by psychologists, and is practically the same as that here stated; but I prefer for several reasons the general formula in which I have expressed the relation. I see no reason to make special reference to afferent cerebro-spinal nerves. Every integratory process, wherever occurring, has its concomitant pleasure; and whether the locality of this process is supplied with afferent cerebro-spinal nerves, is an anatomical question into which we need not inquire. Every function of every part of the organism has come into existence under the stress of the conflict of integration against disintegration, and owes its existence to the fact that in some way it aids the former against the latter; hence every exercise of function is *ipso facto* pleasurable, even although it cannot be carried on without some degree of disintegration. Every exercise of function is most pleasurable when the disintegration that it involves is least in relative amount, and can best be afforded; and remains pleasurable until the disintegration, by means of which it is worked, equals the integration that it effects; when the pleasure dies away, and is succeeded, first by neutrality of affection, and subsequently, when the disintegration exceeds the integration, by pain. Since it is by the consensus of all the functions of all the organs and tissues of the body that the integrity of the body is maintained, and that its further integration is effected, it is evident that the performance of function is the whole and sole source of pleasure, and thus we arrive at Grant Allen's formula.

But, as already hinted, function cannot be performed without disintegration of tissue. Function implies waste. Repair and waste, or as it is now fashionable to say, anabolism and katabolism, are complementary and inseparable. Is pleasure then never experienced apart from pain? The thesis might well be maintained; but all that we need here insist upon is, that every pleasurable process contains of necessity the rudiment of pain, and that the very activity of the process, however pleasurable, is itself the means whereby the pleasure must at length be supplanted by pain. "In sorrow shalt thou eat all the days of thy life."

Although it is abundantly manifest that this proposition expresses a general truth, it is at once evident that it must be accepted with qualifications. The same reasoning that proves the correspondence of

the pleasurable or painful sign of affection with the beneficial or harmful effect of the experience upon the individual, proves also that the same correspondence must exist between the sign of the affection and the benefit or harm, the forwarding or retarding influence, of the experience, upon the race to which the individual belongs; for clearly, if that which forwarded the survival of the race were on balance painful, it would be avoided; and if that which retarded or antagonised the survival of the race were pleasurable, it would be sought; and, in either case, the consequence to the race would be disastrous. It would have to give way to other races in which affection was more appropriately adjusted to the means of survival, and would perish.

What is true of the adjustment of pleasure and pain to the welfare of the individual and of the race, is true, in the case of social animals, of its adjustment to the welfare of the community also. In the case of those animals whose welfare is served, and whose survival is aided, by their association in communities, that experience which is beneficial to the community must be pleasurable, that which is harmful to the community must be painful; for, were affection to be otherwise distributed, it is manifest that the community would fall to pieces, and in cases in which the life of the individual is wholly dependent on that of the community, as in the case of many social insects, the individual, and with it the race, would perish.

It is evident that this threefold adjustment of pleasure and pain must involve inconsistencies, contrarieties, and even contradictions; for that experience which is beneficial, and even necessary, for the welfare of the community, or for the perpetuation of the race, may be inimical to the welfare of the individual; and thus there may, and frequently does, arise a conflict between the pleasures and pains of self-regarding, of reproductive and of social experiences—under which term are included both the reception and emission of motion, both impressions and acts. Indeed we may go further than this, and show that not only may and does such conflict arise, but that it must arise. It is shown elsewhere that the process of reproduction is always and necessarily a disintegrative process; that it cannot be effected save at the cost, in some cases the ruinous and destructive cost, in all cases the temporary cost, of the welfare of the parent. Similarly, it is elsewhere shown that social life is impossible without a partial surrender of freedom of action on the part of each individual in the community, and this interference with the free play of function is of necessity

disintegratory, harmful, and painful in itself, however overwhelming may be its counterbalancing advantages.

If by evil we mean pain, and I know not what meaning can be attached to the word that cannot, in the last resort, be reduced to pain, then that great puzzle to theologians, the Origin of Evil, receives from these considerations its complete solution. Pain is inseparable from animal life because of the very nature of life. As surely as dissolution follows evolution, as decay follows growth, as retrogression follows development, so surely does pain follow pleasure. As intimately as dissolution is bound up with evolution, as function involves waste, as development implies the supersession of the temporary by the permanent, so intimately is pleasure associated with pain. As animal life cannot be continued without propagation, and as propagation cannot be effected without some disruption, some disintegration of the parent, so the continuance of animal life of necessity involves pain; and thus the ancient tradition, that the introduction of evil into the world was consequent upon the reproductive act, receives in some sort the sanction of science. Again, as man is social, and exists in communities only; and as existence in community of necessity implies limitation of individual action, that is, obstruction of function; in this relation also pain is a necessary condition of the life of man. As an animal, subject to the normal cycle of animal life, the cycle of growth from the imperceptible and decay into the imperceptible; as a member of a racial series, obliged either to reproduce his kind, or suffer the privation of the reproductive process; as a member of a community, outside of which he is deprived of the exercise of his highest faculties, inside of which he is deprived of the exercise of some of his lower faculties; man cannot maintain his existence except by the endurance of pain.

> "Ah me, alas! pain, pain ever, for ever
> No change, no pause, no hope! Yet I endure.
> I ask the Earth, have not the mountains felt?
> I ask yon Heaven, the all-beholding Sun,
> Has it not seen? The Sea in storm or calm,
> Heaven's ever-changing shadow, spread below,
> Have its deaf waves not heard my agony?
> Ah me! alas, pain, pain ever, for ever."

Thus, with the suffering Titan, may man apostrophise his fate; and from the countless generations of human life, of every grade, of every period, of every place over the earth in which human life has ever

existed, comes back the silent echo: "For this is our portion; and our lot is this."

Pain, then, is a necessary condition of conscious life, and without pain can no life be; and in the life of man two contrary influences are apparent, two influences, both of them growing and strengthening with his development, the one tending to increase, the other to diminish the total of pain that he suffers. The higher and more complete the development of mind, the greater is the capacity for suffering pain. Supposing that a polype possesses any consciousness at all, it is not imaginable that when we cut it in half, and each half developes into a perfect polype, the division is accompanied by pain comparable with that which a human being suffers from the twitching out of a hair. When a lobster or a crab discards an injured claw, it is not imaginable that it suffers, in the dismemberment, an amount of pain comparable with that which a man would suffer from the loss of a finger. When a horse has a hoof torn off, and walks about unconcernedly upon the raw stump, browsing as it goes, it is not imaginable that it suffers pain comparable with the pain that a man feels when a raw surface is rubbed. So, a savage at the end of a day will cauterise with a glowing coal the foot that he has wounded on his march, and will watch the operation with grunts and noises that have in them as much of satisfaction as of agony; and will sleep untroubled, and walk the next day as freely and as far as his unwounded comrades. On a still higher level, an agricultural labourer will watch with curiosity, but with a callousness that to the operator is amazing, the amputation of a wounded finger, and will prove, by his stolid indifference, that what pain he suffers is incalculably less than would be suffered by some delicately nurtured person from the same operation.

Not only is the infliction of mutilation and bodily injury attended by less pain in those of lower than of higher grade of mind, not only is the capacity of suffering pain greater in the latter than in the former, but the sources of pain are in the latter more numerous. His greater foresight, his power of seeing further into the future, and of seeing the future more clearly, opens up to him occasions of pain which, to the being of less foreknowledge, do not exist. The pig or the ox, which is being fattened for food, revels in his luxurious plenty, with never a thought of the fate that awaits him. Compare him with the traveller who has fallen into the hands of cannibals, and is being fed, as he recognises, for the same purpose! The non-medical man who knows that he is ill, but

knows not that his malady is fatal, is spared for weeks or months, it may be entirely, the pain that is suffered by the medical man, who recognises in his own symptoms the infallible augury of an early death.

The nomad who has lost one or two of his cattle from anthrax or pleuro-pneumonia, suffers no such anxiety for the rest of his means of livelihood as does the civilised farmer who knows the contagiousness and the fatality of these diseases. The telegraph, which is so great a help to civilised man in coping with circumstances at a distance, apprises him not only of possible disasters that he can provide against, but also of disasters against which no provision can be made, and thus adds to the duration of the pain that such disasters bring. The prompt and regular post which keeps him in touch with his relatives beyond sea, and so increases the pleasure, brings him also prompt news of their misfortunes, and so adds to his pain, which, but for the frequent previous correspondence, would have been less, since without it their existence would have been to him less of a reality. So complex have our lives become, that no improvement in our means of dealing with circumstances is an unmixed benefit; and it is true now, as of yore, that he that increaseth knowledge increaseth sorrow.

Happily, the pejorising effect of increase in development is not its only effect. Happily, as mind developes, and as man becomes more sensitive to pain, and liable to be pained from more and more numerous circumstances, at the same time he becomes able more effectually to take precautions against the painful results of these circumstances. To this ability his greater sensitiveness to pain is the first and most potent contributor. For so long as a noxious experience gives rise to no pain, it gives rise to no effort to counteract it. The more highly developed an animal becomes, the more numerous become its points of contact with its surroundings, the more numerous the circumstances that can influence it for good or for evil. If its sensitiveness to pain did not increase *pari passu* with its development in other directions, it would be left without guidance, without warning of the noxiousness of these newly acting circumstances, and so would perish. The greater sensitiveness to pain means that from noxious circumstances, of whose noxiousness we were formerly warned, we now receive a more emphatic warning, while against others less gravely noxious, of which we formerly received no warning, we are now placed on our guard. And although the development of intellect and of intelligence continually adds to the sources of pain, it adds in a higher ratio to our means of dealing

profitably with the circumstances out of which painful experiences arise. To describe and illustrate this progress in all its phases would be impracticable, and, if practicable, would be out of place here; but looking at the matter widely and generally, it is sufficiently obvious that the development of mind in all its phases and degrees involves always one consequence, points always to one end—the increase of pleasure, the relief of pain. Note the life of the savage, to whom danger, and consequently pain, are always imminent—danger of starvation, danger from climate and destructive inanimate agents, danger from wild beasts, danger from enemies, danger from his associates and fellows—and note how, as man rises in civilisation, all these dangers become less imminent, all the corresponding pains more remote and infrequent; how the chronic danger of starvation merges into remittent and intermittent danger from famine; how famines becomes scarcer and scarcer, less and less severe, until at last they are represented by mere increases in the price of food, increases by which a large part of the population is not seriously affected. Note how one discovery after another serves as a preservative against cold and heat, against miasma and disease, against flood and fire; how wild beasts become exterminated; how perpetual warfare becomes broken by intervals of peace, which become longer and longer, more and more secure; how wars, even when they occur, bring a smaller and smaller part of the population into danger; how, within the community, violence and dishonesty diminish; and even in this brief sketch we cannot fail to recognise that development of mind, and progress in civilisation, mean diminution in the sources of pain, increase in the occasions of pleasure.

The question whether the general trend of human life is toward an increase of pleasure and a diminution of pain, so that life upon the whole becomes more desirable as generations go by, is one which scarcely admits of an unqualified answer. There is no doubt whatever that, as development proceeds, occasions of pleasure are increased in number and variety. The civilised man and the man of culture derive pleasure from experiences that are much more numerous and much more varied than are those which give pleasure to the savage and to the day labourer. The sources of pleasure to these are limited to the gratification of the primordial appetites. Those, in addition to such sources, have occasions of pleasure, not only in innumerable beauties of nature to which the others are blind, not only in intellectual performances of which the others are incapable, but in performances of

art which the others cannot appreciate. The pleasures of the cultured man are then more varied; and it is probable that by their very variety they are more frequent, though it may be that the triumphs of simple achievement, within the limited scope of the savage, are as frequent and as pleasurable as are those of the artist and the philosopher in their wider and more complex spheres. It may be that the occasional feast of carrion may afford as much pleasure to a Hottentot as an occasional city banquet furnishes to the gouty alderman. In the fact that the one has not the indulgence as completely at his command as the other, there may indeed be a difference, but on the other hand a pleasure which is always at command soon loses its pleasurable quality; so that, while we recognise that there is a certain elevation as well as variety in the occasions of the pleasures of the more highly developed man, it is doubtful whether we are entitled to say that on the whole his pleasures are more intense, except upon the ground that in him the capacity of feeling pleasure undergoes an exaltation similar to that which we have seen to be undergone by the capacity of feeling pain.

When we turn from pleasures to pains, it will seem that the more highly developed man has a great advantage over his more primitive ancestor. The occasions of pain are undoubtedly more frequent in the life of the less than of the more developed man. A very cursory comparison between the savage and the civilised man has already been made, and when we consider how large a proportion of every civilised community is exempt from not only the crude pains of actual want of food, of clothing, of warmth, of bodily security, but from the less crude but even more severe pain of expecting these privations, we shall be inclined to conclude that, in these respects at any rate, the civilised man has a vast advantage in relief from pain over his predecessor. It is probable however that we are prone to exaggerate this advantage. We are apt to compare the pains of this character from which we are exempt, not with the pains which the savage feels, but with the pains which we should feel if we were in the place of the savage. To the annuitant, to the *rentier*, to the capitalist, it seems a terrible and shocking thing to be uncertain as to how the next meal or the next night's lodging is to be secured; but the tramp bears his uncertainty of these events with complete equanimity; and, as far as we know, the savage does the same. The pain of actual starvation is no doubt great to everyone, but apart from the fact, already noted,

that all injuries produce less pain in primitive than in cultured natures, prolonged abstinence is far less painful to those who always feed at very irregular intervals than to those who take their meals with regularity. Darwin's story of the woman who experienced no pain of cold although the snow was falling on her naked body, shows us how cautious we should be in reading into a primitive consciousness the affection that we ourselves should feel in similar circumstances. Doubtless if a highly cultured product of Western civilisation were set down in a forest teeming with ferocious wild beasts and venomous snakes, and inhabited by cannibal enemies; if he were armed but with primitive weapons, had no clothing to speak of, no house, no tools, no shops, no roads, no police to protect him, and no newspapers to publish his complaints, he would feel very bad; he would analyse his misery, and, when he got back to London, he would elaborate his analysis and publish it in two fat volumes copiously illustrated with photographs and maps. But a savage in the same situation would feel very differently. He would take a great deal of the unpleasantness as completely as a matter of course as the citizen takes the unpleasantness of a rainy day, or a Lord Mayor's show; and the remainder he would regard very much as the sportsman regards big game shooting—as pleasurable excitement. Next week is indefinitely future to the savage, and a sentence of death to be carried out in a fortnight would be much the same to him as to a first-form schoolboy would be the promise of a flogging when he should come of age. That we are wiser, cleverer, wealthier, more moral, more sober, bigger in physique, and in every way finer fellows than our ancestors, we may complacently admit; that we have vastly more opportunities of pleasure, and are relieved of many occasions of pain, we must acknowledge; but whether, upon the whole, our pleasures exceed our pains in any higher ratio, must remain doubtful. Unquestionably both pleasures and pains are raised to higher and higher powers as development proceeds; the capacity of appreciating both is extended; they become keener, intenser, more numerous, more varied; but that they change in their ratio to one another there is no evidence to show. If we "still track the future, in the fresh print of the o'ertaken past," and augur what is to be from what has been, we have no reason to look forward to a time when pain will be abolished, or even considerably diminished in sum. All that we have any warrant to expect is that occasions both of pleasure and of pain will increase in number and variety; that,

as knowledge increases, new sources of pleasure will be discovered, while experiences now pleasurable will become indifferent; that existing occasions of pain will be diminished, while new occasions will come into existence; that what is taken from each in one direction will be more than balanced by what is added to each in other directions; and that, accompanying this increase in the occasions of both pleasure and pain, will be an increase of sensitiveness to both —an increase in our capacity of entertaining both—so that the general level of both pleasure and pain will be higher, without any material change in the ratio of the one to the other.

From the general propositions, that pleasure corresponds with beneficial and pain with harmful experiences, and that the benefit and the harm may affect either the individual, or the race, or the community to which he belongs, may be deduced explanations of certain anomalies and inconsistencies in the occurrence of pleasures and pains, which have often attracted attention. The truisms are familiar that the experience that is pleasurable to one may be painful to another; that to the same individual similar experiences may be at one time pleasurable and at another time painful; that what is pleasurable or painful at the instant may involve the opposite affection afterwards; and that in the very same experience, at the same time, pleasure and pain may be mingled. The diet of blubber which is so pleasurable to the Esquimaux is revolting to the Hindoo; but to the Esquimaux in his rigorous climate it is beneficial, to the dweller in the steaming plains of India it is harmful. The active and rapid exertion, the running, dancing, jumping and shouting, that are so pleasurable to the child, are painful to the old man; but then to the former they are beneficial, in expending that accumulated motion whose retention would produce disorder, while to the latter they are harmful, for they still further deplete the store that is already empty enough. To the fasting man eating is pleasurable, for it is then beneficial; to the same man when his stomach is gorged with half-digested food, eating is painful, for it is then harmful. To him who is refreshed by a day of satisfaction and a night of sound sleep, strenuous exertion is pleasurable, for it is then beneficial; to him who is worn out by fatigue and insufficient food and sleep, strenuous exertion is painful, for it is then harmful.

That what is pleasurable, at the instant of doing or suffering, may ultimately result in pain; and, *vice versâ*, that what is painful at the instant of doing or suffering, may subsequently be a source of pleasure,

are sequences of experience which depend upon the imperfect adjustment of man to the conditions of his life; upon that very progress under which the conditions of his life are constantly changing; and these sequential discrepancies between the pleasure and pain, the benefit and harm, of single experiences, impart into human life the possibility as well as the necessity of morality and immorality. For, as elsewhere shown, by morality is meant the postponement of a less immediate pleasure for the sake of greater future pleasure, or the suffering of present pain for the sake of future benefit. In other words, it is the choice, among experiences whose immediate effect is different from their ultimate effect, of those which are on balance most advantageous. That the twofold and contrary result should attach to a single experience, is of course in no respect inconsistent with the doctrine which attaches pleasure to beneficial and pain to harmful experiences. What we have to recognise is that an experience which in the long run is harmful, and therefore productive of pain, may in its immediate effect be beneficial, and therefore productive of pleasure; and *vice versâ*. The expenditure of motion upon a recreative activity may be ultimately more harmful than expenditure of the same quantity of motion upon remunerative but distasteful work; and in the ultimate result, the acquisition or non-acquisition of the reward of labour, the second experience is more beneficial and therefore more pleasurable than the first. But in its immediate effect, the recreative activity, the expenditure of motion from areas which are replete, is more beneficial than expenditure from areas that are comparatively deplete. So the dismemberment that we suffer by the extraction of a tooth, is painful in proportion to the harm that we suffer by the loss of so useful a member; while the subsequent pleasure that we derive from the cessation of toothache, is proportional to the benefit that we derive from the cessation of a disintegrating process.

Another way in which a single experience may have a double accompaniment, including both pleasure and pain, an accompaniment in which the pleasure and pain occur, not at different periods of the experience, but in simultaneous conflict with each other, is seen in those experiences in which the welfare of the race or of the community conflicts with that of the individual. Whatever, in the experience, is beneficial to the race or to the community, has its accompaniment in pleasure; but if the experience is at the same time, as it well may be, and often is, harmful to the individual, it is *pro tanto* accompanied by

pain; and this pain is often simultaneous and mingled with the pleasure, otherwise derived, that accompanies the experience. In the case of racial welfare, the long-continued operation of natural selection has provided that the pleasure, immediately derived from experiences that are of service to the race, shall overpower altogether the pain derived from their harmful effect upon the individual; and thus we find that, as a rule, the individual is always ready and eager to sacrifice his own welfare for direct benefit for the race. We see this not only in the sexual relationship, in which self-sacrifice is always and of necessity involved, but also very conspicuously in the parental relation. We see among the lower animals how the most timid and shy become bold in defence of their offspring; we see how the partridge and the lapwing will court danger to give their chicks the opportunity of escape; and we see in mankind how willingly labour is undertaken, tasks are performed, indulgence is foregone, pleasures are renounced, that the offspring may be nourished, cherished and provided for. It is not that the parent does not feel the pain of privation and renunciation. This pain he feels and undergoes willingly, in face of the pleasure that he simultaneously derives from the benefit accruing to his offspring.

Similar facts confront us when we examine the inconsistency that so often arises between the welfare of the individual and that of the community to which he belongs. We see how eagerly the soldier ant and the working bee sacrifice themselves for the benefit of their community; and we see, moreover, in the human race, how the pleasure of contributing to the welfare of the community often overpowers the pain that the individual suffers in the efforts he makes for patriotic purposes. We see how the patriotic soldier emulates the ant and bee in incurring wounds and death for the welfare of his country; and we see how the pious founder deprives himself of means of enjoyment, to better the condition of the poor and needy, both in his own and in future generations.

The discrimination of these three different sources of pains and pleasures leads us to the consideration of the different values that are severally attached to different affections. We find that there are some pleasures, such as those associated with eating and drinking, and with sexual intercourse, that are by common consent regarded as gross, sensual, bestial; that are kept out of sight, and indulged in with some degree of privacy and shamefacedness; while other pleasures, such as those derived from beautiful scenery or poetry, are regarded with

approval, are looked upon as in some way elevated, refined; as feelings not to be concealed, but to be proclaimed and to be proud of. So with pains; a nauseous taste is to be borne until it can be secretly got rid of; there is a certain stigma of disgrace attaching to a bellyache; the pangs of child-birth are to be suffered in secrecy, and not to be alluded to in public; but no one hesitates to express the displeasure that arises from a jarring sound, a glaring advertisement stuck by a waterfall, a halting rhythm, or a note of bathos in a pathetic scene. Upon what difference in the occasion of the pleasure or pain does this difference in their ethical value depend? I have no doubt that the difference is that first clearly indicated by Grant Allen in his *Physiological Æsthetics*. It is that those pleasures and pains which are occasioned by experiences the most directly concerned with the continuation of the race, and the maintenance of the life of the individual, are held to be the most degraded, while those are more elevated whose occasions are the most remote from the necessary function. In other words, it is the most necessary and primordial functions that are looked upon as the lowest, and the functions that have least direct connection with these primordial functions that are regarded as the highest. The position is so thoroughly worked out in *Physiological Æsthetics* that there is no need to treat it here at length, but a few of its implications may be pointed out.

"'——As for children,' said Mrs. Wadman, 'though a principal end, perhaps, of the institution, and the natural wish, I suppose, of every parent—yet do not we all find, they are certain sorrows, and uncertain comforts? And yet what is there, dear sir, to pay one for the heart-aches?—what compensation for the many tender and disquieting apprehensions of a suffering and defenceless mother who brings them into life?'

"'I declare,' said my uncle Toby, smit with pity, 'I know of none; unless it be the pleasure which it has pleased God——'

"'A fiddlestick!' quoth she."

Mrs. Wadman's reluctance to pursue the subject was an illustration of the low estimation in which the pleasure is held, but this low estimation applies to that pleasure only which is occasioned by the performance of function most immediately and directly concerned in reproduction. A lower degree of the same disesteem attaches to the previous stage, the stage of courtship, whose concern with the reproductive function is of course less direct. It is not entirely tabooed. It may be spoken of,

discussed, written about; but yet its actual performance is always conducted furtively, clandestinely, and without avowal of its purpose. Even the yet more indirectly connected function—the adornment of the person preliminary to courtship—while it is calculated and intended to attract attention, yet is the occasion of embarrassment when the attention is attracted. Thus we see that the most primordial function of all, the function for the sake of which all other functions exist, is attended throughout all the stages of its performance by some degree of embarrassment and shame. The function next in rank upon the scale of vital importance is that of conserving the life of the individual, and the more direct the bearing of any process upon this function, the lower in grade is it considered, and *vice versâ*. All processes directly connected with the gastro-intestinal function are more or less dishonourable and are effected in concealment. The deposition of ejecta of all kinds is an occasion of shame. Even the blowing of the nose has to be conducted as unobtrusively as may be. The case of eating, which upon this principle should be a function of very low rank, seems to be an exception, since it is so commonly conducted in company, but the exception is less conspicuous than at first sight appears. To come unexpectedly upon persons engaged in eating, or to be in their presence without sharing in, or ministering to, the process, is always an occasion of embarrassment. If we, having no part in the function, enter a room in which people are at dinner, the incident is embarrassing to both parties; it is embarrassing to us even to find our own servants thus engaged. If we pass a labourer taking his homely meal by the roadside, we pass with averted eyes; and although the exigencies of our lives make community in eating necessary, yet every possible device is adopted to distract attention from the process itself, and to concentrate it upon its adjuncts and concomitants. The noisy eater, the greedy eater, the eater who concentrates his attention upon eating, who is critical about the nature and quality of his food, is disgusting. Only on condition of the process being conducted *sub silentio* and with some show of indifference, is associated feeding tolerated; and in any case the pleasures of eating are admittedly and acceptedly gross pleasures; they are pleasures of a low grade, of an unworthy kind; they are enjoyed with reticence and self-restraint. The pleasure of a good dinner may be on the whole greater than that of a beautiful landscape, poem or symphony, but no one with any self-respect will express the same appreciation of the first as of the

others. No one goes into raptures over his dinner, or apostrophises it in emotional language; it is not described in prose or lauded in verse. What poet has sung the beauties of a beefsteak or a leg of mutton?[1] As with the pleasures connected with eating, so with the pains; they are of low grade; they are matters not to be brought forward and paraded, but to be kept out of sight and ignored as much as possible. Nausea, vomiting, colic, are not to be freely discussed and described, but to be treated confidentially between oneself and one's doctor.

It is not necessary to enumerate the other functions and modes of activity, and to show how in all the same rule applies—how the pleasures and pains associated with them are regarded as of low grade in proportion as they are more directly associated with the process of reproduction and of conservation of the individual; are less degraded, less gross, the less directly they are associated with these processes; while the pleasures and pains connected with the conservation of the community have a peculiar quality which we designate by the term "ethical"; and those which are associated with functions that do not perceptibly affect the welfare of either the race, the individual or the community, are termed recreative when the function is preponderatingly active, or involves the emission of motion, æsthetic when it is preponderatingly passive, or involves the reception of motion.

Much speculation has been expended upon the question whether any conscious state is absolutely neutral with respect to pleasure and pain, or whether affection is an inseparable accompaniment of every state and process of consciousness. It is evident from the biologic point of view, that though it is not likely that the processes of integration and disintegration are ever exactly balanced, yet there are large portions of our lives when the preponderance of one or the other is at any given moment so slight, that the corresponding affection is neglectably small; and the direct examination of consciousness yields the same result.

[1] It is dangerous to assert an absolute negative, and as I write these lines there occurs to me the old doggerel—

"Gently poke and stir the fire,
Lay the mutton down to roast,
Baste it freely I desire,
In the dripping put a toast," etc.,

but the instance is scarcely an exception.

It is a trite observation that the range of intensity of pain is far greater than that of pleasure. Under favourable circumstances, a pleasurable state of consciousness soon attains a maximum, after the attainment of which no addition of beneficial experience makes any appreciable addition to the degree of pleasure. To the intensity of pain there seems scarcely any limit, or, if there be a limit, it is at an immeasurably greater distance from the neutral point than is the limit of pleasure. From the biologic standpoint, the reason of this discrepancy is clear. Grant Allen explains it thus: "Massive Pleasure can seldom or never attain the intensity of Massive Pain, because the organism can be brought down to almost any point of innutrition or exhaustion, but its efficient working cannot be raised very high above the average. Similarly any special organ or plexus of nerves can undergo any amount of violent disruption or wasting away, giving rise to extremely Acute Pains; but organs are very seldom so highly nurtured and so long deprived of their appropriate stimulant as to give rise to very Acute Pleasure. Hence the common experience that our greatest Pleasures fall far short in intensity of our greatest Pains. It is such a rare instance alone as that of the sexual organs, where stimulation only takes place (in normal cases) after long intervals of rest and nutrition, that Pleasure rises to the same pitch of monopolising consciousness which is so ordinary a result of excessive Pain." While I should generally agree with this statement, I should prefer to put the case in a somewhat different way. The intensity of a state of consciousness is always proportional to the magnitude and the suddenness of the bodily change with which it corresponds. The process of integration, of building up, of evolution, is not only a slow process, but it is a process also whose magnitude is limited by the inherent limitation of the capacity of the organism for development. It is only at a certain very moderate rate that an organism can grow, can develop, can add to its means of dealing with circumstances; that the race can be multiplied; that the community can be strengthened and consolidated. These changes take place slowly, and in short time can never be of large extent; and consequently the pleasures, which correspond with them, are but of moderate intensity. But the process of disintegration, of destruction, of tearing down, of dissipation, is under no such inherent limitation of time. The tree that has taken a century to grow can be cut down in an hour, or shivered by lightning in an instant. Neither in extent nor in rate of progress is there any such

limitation to the process of disintegration as inheres in the process of integration; and consequently, the intensity of pain is under no such limitation as that of pleasure.

Corresponding as they do with integrations and disintegrations of the organism, pleasures and pains do not admit of any definite relegation, of some to the object-consciousness as well as of others to the subject-consciousness, of which the other primary divisions of mind are susceptible. All pleasures and pains belong primarily to the subject-consciousness, for they all correspond with changes in the internal distribution of motion. Many of these changes are, however, so directly enforced by the incidence of motion from environing circumstances, that not only may these circumstances be properly taken into consideration in the classification of the affection, but it requires some nicety of analysis to separate the affection from the sensation, thought or volition to which the affection is due. When this is done, pleasures and pains, powerful and dominant states of consciousness though they are, have usually a vagueness of characterisation, of localisation, and often of duration, which renders their description very difficult. Nevertheless, pleasures and pains, although they are always characterised by the identification with self which marks the subject-consciousness, may for practical purposes be divided along the lines of subject- and object-consciousness, according as the conditions, which determine the integration or disintegration, arise in the commerce between the nervous system and the body at large, in which case the affection is peculiarly and especially subjective; or as these conditions arise in the commerce between the organism as a whole and its circumstances, in which case the affection assumes a certain quasi-separateness from the innermost self, which allows us to regard it as relatively objective. Bearing in mind that the separation from self is to some extent artificial and arbitrary, we may now consider separately the affections associated with changes in the object-consciousness, and we may divide them according as they are associated with Sensation, Volition, Thought, or Memory, in the field of object-consciousness.

AFFECTION AND SENSATION

That Sensation is pleasurable so long and so far as the impression with which it corresponds contributes on balance to integration, and is painful as soon as the arriving motion produces disintegration in excess of integration, scarcely needs insistence. That pressure and friction in moderate degree increase the activity of the nutritive process in the skin pressed or rubbed, is evidenced by the increased flow of blood to the part after a temporary experience of this nature, and by the thickening of the skin that takes place when the experience is prolonged; and such degree of pressure and friction is pleasurable. Greater degrees of pressure and friction produce bruises and blisters, that is, are harmful and disintegratory; and, correspondingly, these degrees are painful. As with degree, so with quality; certain forms of motion are disintegratory even in minimal quantity, and even in minimal quantity they are painful. Such are the forms of motion that occur when bitter substances come in contact with the tongue, or when the waves from a perpendicularly held slate pencil impinge upon the ear.

Of the alimentary substances that are integratory when assimilated in digestion, those of which our race has had secular experience, and time to become adjusted to, are pleasant to taste; and similarly, of disintegratory edibles, those of which we have had a sufficiently lengthy experience are become distasteful; while those of which our experience is as yet insufficient, are not yet become, in the one case agreeable, in the other disagreeable. All beneficial edibles give pleasure in the process of digestion or assimilation; all harmful edibles give pain either in digestion or in assimilation; that is to say, when their beneficial or harmful qualities become operative. But, as it is of vital importance to the animal organism that the former should be chosen and the latter should be eschewed; and as, when digestion, and still more when assimilation, is once begun, the choice cannot be altered; at the entrance to the alimentary canal has been evolved an apparatus, by which the beneficial or harmful qualities of edibles, at least of those classes of edibles which are most frequently met with, are made apparent by the pleasure or pain that they occasion while yet they are on the threshold of the organism, and are capable of

rejection. In so far as the adjustment has been effected, the edibles whose smell or taste is unpleasant are harmful if eaten, while those whose smell and taste are pleasant are wholesome. But the adjustment of the agreeableness of smells and tastes to the wholesomeness of the odorous or sapid substance is a tedious process, requiring for its perfection many generations of trial and error; it is therefore complete for those classes of edibles only that occur most frequently in experience. For these the guidance of smell and taste may be accepted, while for unfamiliar edibles it is not trustworthy. That which is sweet, that which is savoury, will in the majority of cases be wholesome when digested. That which is sour, or bitter, or nauseous, will in the majority of cases be unwholesome. In the case of smells and tastes, the pleasure and displeasure is adapted, not so much to the benefit or harm actually produced by contact with nose and mouth, as anticipatorily to the benefit or harm which will follow upon ingestion; and the adaptation is complete in respect of those substances only which have occurred with great frequency in experience.

In the case of temperature, the sensation corresponds, not with the reception of motion only, but with an interchange of motion that includes emission as well as reception. It is probable that this is really the case with other sensations, but in no other is it as conspicuous as in the case of temperature. When the amounts emitted and received are in balance, the sensation is neutral; when either becomes excessive, pain begins, and increases with the degree of the excess; when, either emission or reception being excessive, the excess is diminished and the balance restored, the sensation is pleasurable. When thermal motion is received in excess, its addition to that already existing in the tissues produces disintegration of tissue, in proportion to the excess; and when this form of motion is emitted in excess, the amount emitted can be provided only by the combustion, that is to say, the disintegration of the tissues; so that in either case the rule holds good. When the excess in either direction ceases, the disintegration ceases, and integration resumes its normal preponderance; and correspondingly the restoration of the balance is accompanied by pleasure.

That the mere reception of luminiferous motion is conducive to integration of the animal organism, is evidenced by the formation of pigment and of hæmoglobin under its influence, and correspondingly, the mere sensation of light is pleasurable, the diminution and

deprivation of light are attended by diminution of pleasure; and if the deprivation is complete and prolonged, the misery of its absence is very great, as was known to those who were punished, under the old prison system, by immurement in the dark cell. Excess of light is accompanied by pain, and that it is accompanied by disintegration also is shown by the damage, temporary or permanent, to the visual organ that ensues upon the excess.

What effect the deprivation of sonorous vibrations would have upon us, we have no means of knowing, for we are never without them. The deaf are, it is true, deprived of the special mode of sensation which corresponds with these vibrations, but apart from the unhappiness derived from the loss of a means of communication with his fellows, the deprivation does not seem to be in itself painful. It is not improbable that, just as the blind man who goes much into the sunshine becomes freckled or bronzed, and gains the pleasure corresponding with the gain in integration, though he has no sensation of light, so the deaf man may gain, from the continual impact of aerial vibrations, a stimulus which helps him in his struggle for life, even if he hear no sound; and it may be that no inconsiderable part of the pain of immurement in a dungeon lies in the privation of these vibrations that the prisoner suffers. On the other hand, when the aerial vibrations attain to an intensity at which they inflict damage upon the delicate structures that are adapted to their reception, the sensation attending their reception is coloured by pain; and the greater the damage inflicted, the greater the pain experienced.

It has been hinted on a previous page that sensation, while it corresponds primarily and chiefly with the reception of motion, is yet the accompaniment of a process that includes emission as well as reception. Action cannot take place without reaction, and the reaction begins immediately upon the reception of motion. Impinging motion liberates, immediately upon its incidence, some of the motion contained in the peripheral nerve endings, as well as, less immediately, the motion in the recipient nerve centres. The pleasure or pain that accompanies sensation is determined very largely by the relation which the amount of incoming motion bears to the amount of motion liberated in the immediate reaction. So long as the amount liberated is well within the capacity of the end-organ or the nerve centre to expend without injurious disintegration, the sensation is wholly pleasurable; as the limit of uninjurious expenditure is approached, the pleasurable quality

of sensation diminishes; when the limit is reached, the pleasurable quality disappears; and when it is passed, the pleasure is replaced by pain. It is unnecessary to establish this position by illustrative examples, for the whole subject has been thoroughly dealt with in detail for each mode of sensation by Grant Allen, in the book already referred to.

AFFECTION AND THOUGHT

The connection between pleasure and pain on the one hand, and thought upon the other, demands consideration from two points of view, according as we consider the affection that attends the process of thought, or that which attaches to the result of thought.

The pleasure that attends the easy establishment of relations between states of mind; the pain that attends the laborious effort to establish relations which still refuse to be established; the pleasure that attends our final success in achieving the establishment of a relation that has long baffled our efforts; all these are here considered as affections, not of thought, but of volition; since, of the process compounded of thought, volition and memory to which they are attached, it is the volitional element with which they are most closely associated. There is a particular affection, however, which may be considered here, since it is more closely associated with the cognitive than with the volitional element of thought, and that is the pain that attends an experience of incongruity, and the pleasure that attends congruity of experiences.

The fact that affection is thus determined is very familiar to us all. We are all familiar with the pleasure that arises when our experiences are congruous with one another, when a new observation fits in with previous knowledge; when we are able to assimilate several events under one law; when we can make a valid generalisation; when we can recognise similarity in diversity. It is the allurement of this pleasure that leads the man of science to spend laborious days in the observation and classification of phenomena; it is the achievement of this pleasure that is his highest reward. It is to this pleasure that literature owes most of its attractions. It is in this that a very large part of the pleasure of pictorial skill consists. It is this that leads the artificer to mould his work into some familiar form, to decorate it with some familiar device. It is in this that so much of the pleasure consists that

we derive from the dramatist and the actor. This is the origin of that note of pleasure that we experience when we find the letter of a schoolboy of ancient Egypt asking his father for pocket-money, or the contract for the sale of a house in Babylon; when we recognise the same tribal customs in the Brehon laws of Ireland, in the *jus civile*, in the Brahminical textbooks, in the Russian Mir; in the Senchus Mohr, the Book of Manu, and the canon law.

The pleasure of a good novel consists largely in a good depiction of character; that is to say, in the general congruity of each of the acts, of each person depicted, with his other acts, and with the ways in which we know from experience that people commonly do act. The pleasure of poetry consists largely in the similes and metaphors with which it abounds, and which bring home to us unsuspected congruities. To simple-minded people, the pleasure of pictorial art is in the depiction of scenes with which, or with the like of which, they are familiar. They find pleasure in pictures of their homes, of their surroundings, of people doing things that they are wont to do, or expressing emotions to which they themselves are prone. Minds of a somewhat higher order are pleased by congruities among the several parts of the picture itself; they speak approvingly of its harmony of colour, of the balance of its parts, and so forth; while with incongruities, with limbs "out of drawing"; with anachronisms of dress or other circumstances; with inaccurate portraiture; with erroneous representation of any kind; that is to say, with appearance that is incongruous with experience, they express displeasure. Similarly, persons of undeveloped minds find pleasure in furniture and appliances which reproduce familiar things. They like a clock that pretends to be a cricket ball, or a cottage; a brooch in the shape of a pig, or a horseshoe; a pencil like a gun; the medical student likes a tobacco jar in the shape of a skull, the sportsman prefers his like a fox's head; and so forth. To more developed minds, the incongruity of the article with the thing that it professes to represent is more striking than its congruity, and to them therefore such objects are more displeasing than pleasing. So, too, the more rudimentary mind likes to see upon the stage the scene with which he is familiar. The pit of a London theatre is crowded to see a representation of the Derby. The gallery loves to see a policeman or a private soldier on the stage; the stalls and the dress-circle prefer a drawing-room scene. The more accurately a scene is depicted—a race with real horses, a cascade with real water—the

more congruous the whole scene with actual experience, the greater the pleasure derived from it. With more developed minds, the congruity needed to give pleasure is a different kind of congruity, or rather is a congruity between experiences of a different class. They are pleased when the later acts of a character are congruous with his previous acts; when his conduct in one set of circumstances is congruous with his conduct in another set. "That," they say, "is exactly the thing that such a man would do in such a case," and this congruity, between the conduct of the character represented and their general experience of human conduct, gives them pleasure; and conversely, a play in which the characters act incongruously is displeasing. "No man who was as clever as he is supposed to be, could be such a fool as to act like that" is the disparaging criticism that is passed in such a case, exposing the incongruity, and attributing to it the displeasure that is experienced.

It is the same perception of congruity that gives us pleasure when a puzzle is satisfactorily solved. Besides the pain of bafflement that accompanies our unsuccessful efforts, there is also the discomfort of the incongruity between the terms of the problems set and the terms of the solution; and when the problem is solved, besides the pleasure of achievement, there is the additional pleasure of the establishment of congruity. All exceptions to rules are discomforting; and are discomforting by reason of their incongruity with the cases that follow the rule. When we can include both the exception and the rule in some more comprehensive rule, there is the pleasure of the achievement, no inconsiderable part of which is due to the establishment of congruity amongst our experiences. The study of antiquity attracts us chiefly by the innumerable congruities that it discloses. Our impatience at the observance of some absurd and irrational custom, is turned into pleasure when we are able to trace the custom back to its source, and find that there was once a state of things with which it was congruous. We are belated in some sleepy little town, and our slumbers are broken at six in the morning by the obtrusive tinkling of a bell. Apart from the displeasure of being awoke untimely, we are displeased by the incongruity of the sound with our customary experience. But when we make inquiry and find that the bell is the Curfew, and has rung at that hour uninterruptedly every morning for more than eight hundred years, the establishment of its congruity with custom yields us pleasure. On the outskirts of the village we find by the roadside a small inclosure,

its fence rotting, its gate fallen to the ground, and well-nigh hidden by the rank growth of weeds which infest it. It is not large enough for a paddock; it is not small enough for a pigsty; a thing constructed with trouble and expense must have a use, but its uselessness for any purpose that we can assign, irritates us from its incongruity with our experience. Then our companion tells us that it is the Village Pound, an institution "far older than the King's Bench and probably older than the Kingdom," and at once our irritation subsides, and we gain a distinct pleasure from the explanation which abolishes the incongruity, and reconciles our observation with our experience. Similarly, when we find from the buildings, the arrangements, appliances and utensils of Herculaneum and Pompeii, how congruous to our own were the details of daily life in those far-distant times, the recognition of the congruity yields us a distinct accession of pleasure.

It is in scientific studies that the pleasures derived from the perception of congruity are most conspicuous and most frequent. Every step in science, whether it be in original discovery, or in the acquisition of the knowledge of the discoveries of others, is an explanation of some phenomenon, and by explanation we mean the dissipation of an incongruity, and the establishment of congruity between that and other phenomena. If a thing needs explanation, it is because it is in some way incongruous with other experiences; if it is explained, it can only be by its reconciliation with other experiences,—by displaying its congruity with them,—and the greater the previous incongruity, the greater the pleasure when congruity is established. This is the origin of the pleasure with which we welcome the laws of Kepler and of Newton, this the reason of the avidity with which we follow the working of natural selection.

As the greatest pleasure that we gain from the establishment of congruities is derived from the study of science, in which the discovery of congruities is most frequent and most striking, so the pain that we suffer from the experience of incongruity is most frequent and most severe in connection with our Beliefs. An experience that is incongruous with a belief, is painful in proportion to the degree of the incongruity, and to the degree of cohesion of the belief.

It gives us little pain to have an experience which conflicts with a thought that has been only tentatively established, and that possesses as yet little cohesion. We can abandon it without a sigh. But let the experience conflict with some belief which has taken possession of us,

has become maximally coherent, is part of our very being, and a pivot upon which important portions of our conduct turn, and the pain of the incongruity is very great. Thus, we have a maximally coherent belief, a belief amounting to certainty, that the visible appearance of a solid body is associated with tangibility and resistance. It happens, however, in the experience of some people, that the visible appearance of a solid body is what is termed an hallucination, and that when an attempt is made to handle the appearance, there is neither tangibility nor resistance experienced. Such an experience is shocking and painful. Again, we have a belief, almost equally coherent, that spontaneous movement, movement that is not communicated from without, is confined to, and characteristic of, living beings. If, then, we have experience of an object which we know to be inanimate —a table or a chair—moving with apparent spontaneity, and with no discernible means whereby movement could be communicated to it, the experience is shocking and painful. Even dogs have been known to display terror at such an appearance. When the beliefs are less coherent than these, an experience that is incongruous with them is still painful, though in a less degree, and in place of the dismay and horror that are aroused by experiences contradictory of our most coherent beliefs, attacks upon beliefs that are less coherent give rise to anger, the natural reaction upon the infliction of pain. In a person whose religious belief is maximally coherent, an attack upon this belief —the presentation of an experience incongruous with it—arouses as much dismay and horror as does the apparition of a solid that is destitute of resistance. Experiences that are incongruous with beliefs, religious or other, that are not maximally coherent, gives rise to pain that is severe in proportion to the cohesion of the belief, and to the degree of incongruity of the experience. The intensity of the anger that is aroused may be taken as an index of the intensity of the pain inflicted; and we see that the more coherent the belief, and the more dangerous the attack, the greater the anger that is aroused by an attack upon it; while, on the other hand, no one feels very angry at an attack upon a belief that he does not hold very strongly, nor at a feeble attack upon a belief that he does strongly hold. Still, whatever the subject of the belief, we feel pain when it is disturbed, even though the belief has no direct biological importance—no direct connection with our welfare. For example, we feel distinct discomfort when the acts of some historical personage are shown or alleged to be incongruous with the

character that we attribute to him. We resent scandal about Queen Elizabeth; we are annoyed when Henry VIII. or Henri IV. is held up as a model of marital virtue; we are disgusted when Jefferys is alleged to have had a tender heart, or Napoleon a tender conscience; when Cromwell or Cavour is accused of want of patriotism, or Bayard or Luther of want of courage. No doubt the resentment that we feel at the disturbance of such beliefs is derived from the general resentment that we feel at the disturbance of beliefs that are of biological importance. The resentment that is aroused by attacks upon religious belief, upon the belief that prevalent customs and conventions are right and necessary, has a biological origin. It is a very powerful force, that is conservative in both senses of the word. It endows all existing institutions with an inertia which opposes every tendency to change, and so is conservative in the political sense; and, by preserving uniformity of conduct within the community, it tends directly to preserve the community from disintegration, and so is conservative in the scientific sense. There is no doubt that, as will be shown when we come to deal with Conduct, this tendency to resent the introduction of change has been fostered and developed by the action of natural selection; but by natural selection alone it cannot have originated. Natural selection, as its name implies, is destitute of originating power. Give it but the smallest rudiment of a capacity, and, if the capacity be useful, it can cherish and increase it without assignable limit; but, before it can act, it must have a rudiment to act upon. Now the rudiment of this most important faculty of resenting and resisting change seems indubitably to be furnished by the inherent painfulness of the disturbance of belief which we are now considering.

For, while we have hitherto dealt with that pain only which accompanies disturbance of belief, it is manifest that this is but one case of a larger principle. A belief is a cohesion between two mental states, and has for its physical basis a connection between two nerve-processes, such that these processes are associated together in action. But this is the physical basis not only of belief, but of habit, of determination and of instinct; and hence, if that which conflicts with belief is painful, painful also will be any experience which conflicts with instinct, with habit and with determination. And this is unquestionably the case. The miserable restlessness that is exhibited by the bird which is prevented from migrating, by the rabbit which is excluded

from its burrow, by the rodent which is deprived of material to gnaw, by the social animal which is deprived of society, is repeated not only in the baby who is deprived of its nipple, in the child who is denied opportunity of active exercise, in the lover whose course of true love is obstructed, but in the habitué of the club whose customary armchair has been appropriated by a new-comer, or whose daily rubber is prevented by the absence of his cronies; in the student whose daily constitutional is interfered with by an untimely visitor; in the paterfamilias whose dinner is half an hour late; in the man of action whose determined course is checked by an obstacle; and in the statesman whose carefully devised policy is frustrated by the obstinacy of his colleagues or the indifference of his supporters. All these cases, widely different as they are in their manifestations, agree in being occasions of pain, agree in the occurrence of pain upon obstruction occurring to the free transference of motion along a prepared path from one portion of nerve tissue to another.

If now we turn our attention from the process of thought to the result of thought, we find that not every thought is accompanied, on its establishment, by an appreciable affective colouring. A multitude of the daily processes of discrimination, of assimilation, of generalisation, classification, perception and inference, both mediate and immediate, are reached, without their formation appreciably affecting the preponderance of integration or disintegration, without resulting in any appreciable disturbance of the balance of neutrality in the direction either of pleasure or of pain; and such processes are termed purely intellectual. Only when the thought attained is the appreciation of some relation between the organism and its circumstances, which, as appreciated, affects favourably or unfavourably the welfare of the organism, does the state of pleasure or pain arise; and each such affection, together with the thought by which it is engendered, and another element to be considered presently, constitutes the complex state of mind which is termed an Emotion.

According to this view, Emotion is not feeling alone, but is a very complex mental state made up of thought, of pleasure or pain, and of feeling in various proportions. Much importance is attached by all recent writers on psychology to the different bodily states which accompany different emotions—to the blanching, sweating and trembling of fear; to the frowning, flushing and muscular tension of anger; to the sneer of scorn; the tears of grief; the shrug of impatience; and so forth;

and at least two authorities, Mr. W. James and Mr. Alexander Sutherland, are of opinion that emotion consists solely in the state of consciousness corresponding with these bodily changes. Undoubtedly the state of consciousness corresponding with these changes, and especially, as Mr. Sutherland insists, with the vascular changes, is an exceedingly important—is the most important—constituent of the emotion; and indeed, if we choose to limit the connotation of the term to this state of consciousness alone, we should be justified in doing so, but there are objections to such a course. In the first place, the state of consciousness corresponding with the circulatory, visceral, muscular, glandular and other changes is itself complex, and comprises always two distinguishable elements. It comprises always an element of quality according to the particular locality and nature of the bodily change, which differs in each emotion, as for instance the excessive action of the lachrymal gland in grief, in contrast with the defective action of the salivary glands in fear; and, in addition to this special quality, it comprises also an element of pleasure or pain according as the direction of the bodily change is on the whole integratory or disintegratory. In the second place, every emotion depends, for its origin and nature, entirely upon the character of a thought on which it pivots. Fear is felt only upon the cognition of some fearful agent threatening the organism. Grief is felt only upon the cognition of some grievous event. Without the cognition no emotion is experienced. Take away the cognition and the emotion disappears. We may, if we choose, continue to regard the emotion as consisting solely in the consciousness of the bodily changes, and in the pleasure or pain which they involve, and regard this emotion as distinct from, although dependent on, the thought; but the connection is so intimate, the dependence so absolute, that it seems more appropriate to regard the thought as a constituent and integral part of the emotion, and to regard the latter as a triad made up of the thought, the affection, and the consciousness of the bodily change.

The thought, then, is an integral part of the emotion, and the character of the emotion depends wholly upon that of the thought which is its fundamental constituent. This thought may be a percept, as when we find ourselves in the presence of an antagonist; or it may be a concept, as when we learn of the loss of a dear friend; or it may be a pure memory, as when we blush at some past indiscretion; but in any case, the first event in the occurrence of an emotion is the

thought of some relation between the organism and its circumstances. If the thought is that of the antagonistic relation in which some agent stands towards us, then the emotion belongs to the large class of antagonistic emotions; and its specific character depends upon the estimate that we form, upon the cognition that is arrived at, upon the inference that is drawn, as to the power and noxiousness of the agent with respect to ourselves. If the thought is the belief that we have incurred the deserved reprobation of the community to which we belong, the emotion is that of shame; if it is the knowledge that some beneficial event that we were expecting has missed fire, and will not occur, the emotion is one of disappointment. Whatever the emotion, it cannot arise except upon the inception of a thought. Upon the nature of this thought the character of the emotion wholly depends, and if the thought be modified or abolished, the emotion changes its character or disappears.

Upon the inception of the thought occurs a change of bodily state, consisting in incipient movement in this or that direction, or arrest of movement; in increased or diminished activity of this or that gland or set of glands; in modification of blood supply to this or that locality, or generally; in increase or decrease of respiration; and so forth. All these specific changes of bodily state are active memories of the ways in which similar experiences have been dealt with in the past, either by ourselves or by our ancestry; all are memories, called up in the usual way by association; and all have accompaniments, more or less prominent, of conscious memory. Such conscious memories are partly memories of incipient volitions, and in so far belong to the object-consciousness; partly they are memories of organic bodily processes, and in so far belong to the subject-consciousness. The whole of them together constitute a voluminous wave of feeling which constitutes a large part of the emotion, and, as already stated, is by some psychologists considered to be the whole of it. As the reactions of the organism to differing sets of circumstances differ; as, according to the estimate that is formed, for instance, of the power of a noxious agent, we prepare either to crush it, or to fight against it, or to fly from it, or to cower before it; so, according to this estimate, and to the consequent preparatory reaction, we experience the emotion of contempt, or of anger, or of fear, or of terror; and thus the character of the reaction, as determined by the thought, determines the general character of the emotion. It is to be remarked here that

this mass of bodily changes is initiated centrally. It owes its origin to nerve currents proceeding from the very highest region of the nervous system, as is evident from its absolute dependence upon thought. In the sense of responding to an external impression, they may, if we please, be termed reflex, although, when an emotion is initiated in a memory, it is rather straining the ordinary meaning of the word so to term it; but in the sense of responding to local calls, such as normally harmonise the blood supply, the glandular activity and other functions, with local needs, they are not reflex, but spontaneous. That is to say, the origin of the currents that drive them is not in centres of low rank regulating portions only of the body, but in the supreme region which represents the whole body, which effects the adjustment of the organism to its circumstances, and which contains the substrata of consciousness. In as far as the currents thence emitted are distributed to the voluntary muscles, and excite or allay their action, even in a nascent or incipient degree only, in so far are they mirrored in consciousness as volitions; and in so far is volition an element in the emotion. But a large part of these currents is distributed among glands, blood-vessels, the involuntary musculature, and other organs, not ordinarily considered as under the control of volition. Yet in this case, at any rate, the action of all these organs is certainly controlled by currents emitted from that very part of the nervous system whose distribution of motion we have found to be the physical substratum and counterpart of volition. There is, therefore, some justification for a view that would regard these bodily changes as being the outcome of volition of the subject-consciousness, but it would be out of place to pursue the matter here. Further reference will be made to it when we come to deal with the subject-consciousness.

Whatever the bodily changes that take place in emotion, their general effect upon the life-worthiness of the organism is rarely neutral. They almost always affect the organism either favourably or unfavourably. They tend, on balance, either to integration or to disintegration; and hence are accompanied either by pleasure or by pain. The affective quality of the emotion is so intimately bound up with the consciousness attending the bodily changes, that the two are rarely distinguished in description, and indeed on introspection it is doubtful whether the two are distinguishable at the time of their occurrence. But just as, looking back upon the experience, we can distinguish between the pain of a cut or bruise and the sensation of the same impression, so on retrospec-

tion we can distinguish without difficulty the subject-sensations emotions from the pleasure or pain which accompanies them. T sensations are often vaguely localisable. In some emotions, as anger, there is a sensation referred to the spine. In most emoti there is a sensation referred to the epigastrium; in grief there i sensation referred to the throat. But in almost all emotions there over and above any localisable sensation, an affection of pleasure pain which admits of no localisation, and which constitutes the third the prime factors of which emotion consists.

If this account of the nature of emotion is correct, it is clear t any classification of emotions, that should group them according their natural affinities, would be founded upon variations of the tho which is the dominant factor in their composition; that there sho be as many emotions and groups of emotions as the relations groups of relations that can subsist and be appreciated between organism and its surroundings; and that a classification of th relations would be a classification of emotions. That this is w have long maintained, and a classification which is exhaustive, which has never been impugned upon the ground that it violates natural affinities of the things classified, has for many years been be the world of psychologists. There is therefore no need to actu reproduce it here, although it is in this place that it properly belo Some comment upon it is, however, due here, in connection with definition of Emotion which has been given. Among the Emoti classified is a large group, which is said to correspond with interacti between the organism and its environment that are neither conserva nor destructive (*The Nervous System and the Mind*, p. 352); an group so characterised would seem to be inconsistent with the st ment that emotion occurs in those bodily states only that are ei integrative or disintegrative. This inconsistency admits of reconcilia in two ways. In the first place, although the relation between organism and its circumstances, upon whose appreciation the emo depends, may not be itself primarily and formally conservative destructive in character, yet interaction between the organism its circumstances can scarcely occur without disturbing to some ex the pre-existing proportion of integrative and disintegrative proce and according as this proportion is disturbed in one direction or other, so will be the affection of the emotion. It must be admi that in some of the emotions of this class the affective colouri

not very pronounced, but if they are carefully examined, it will be found that in none is it wholly absent. The circumstances, for instance, whose cognition arouses a feeling of surprise or admiration, may not be such as appreciably to affect the life-worthiness of the organism, either favourably or unfavourably, but yet they contain some indirect reference to its welfare, and correspondingly some affection, pleasurable or painful, is bound up with the emotion. The nature of the reference is often very difficult to analyse out, but the fact that we actually seek occasions of being surprised and of admiring, as when we visit spectacular displays, shows conclusively that pleasure is derived from these emotions, and with some trouble we may discover the source of this pleasure. For instance, when we derive pleasure from the contemplation of some exquisite piece of workmanship, as in the mechanism of a chronometer, it seems that we are witnessing the triumphant success of some member of the community of which we form a part; and in the success of our community we ourselves share, and hence the justification of the pleasure. In other cases of intellectual emotions, or what I have called, in the classification referred to, the emotions of cognition, the occasion of the pleasure or pain that enters into the emotion can, with a little search, be discovered. It is manifest, however, that the amount of affection that enters into emotion differs very much in the different emotions, being in some, as in fear and joy, very great, and forming the bulk of the emotion; while in others, as in those of justice and curiosity, it is but little. On the other hand, an equal degree of variation is discernible in the other constituents of emotion. In the intellectual group, as its name implies, the element of thought is at its maximum, while the affection and the subject-consciousness is but small. In such an emotion as grief, again, the affection is great, and the bodily changes, and therefore the element of subject-consciousness, are great, while the intellectual element is, in comparison, inconspicuous. In all emotion, however, the three elements can be distinguished, various as their proportions unquestionably are.

An enumeration of the affections of thought would be very incomplete which did not take account of those which attach to the ideal representation of scenes, events, incidents, and operations, which either may or may not eventually come to be actually experienced. The pleasures and pains of planning and projecting future modes of conduct; of reproducing past experiences; of imagining possible or

impossible events, and tracing out their consequences; of castle-building; of novel-reading; of play-acting, and of witnessing dramatic representations; are very real and conspicuous, and occupy appreciable portions of our lives. These are all activities of the recreative class, that is to say, they are undertaken for the sake of employing surplus energy, of utilising the accumulated motion which remains over after the pressing needs of the organism have been supplied. And the pleasure which is associated with them is primarily the pleasure of relief of tension, of exercise of fresh and lively functions; but in addition to this, other occasions of pleasure become secondarily involved. Thought begets emotion, and in these circumstances emotions are aroused, some of which are in themselves pleasurable, while others are painful *in se*, but yet enhance the sum of pleasure by acting as contrasts and foils to the former. In appreciating a narrative of the doings of others, whether the narrative is oral, or written, or pantomimic, we identify ourselves more or less with the actors. Their trials are ours, their anxieties, their hopes, their fears, their triumphs, their defeats; but along with this semi-identification there goes an under-knowledge of the difference; we get the satisfaction of the activity of a fresh and surcharged tissue, without the pain of the emotion which the activity of that tissue implies. The tissue is disburdened of its excess of motion, and is not depleted to exhaustion.

A large element in the affection associated with all intellectual exercise is that which arises from the appreciation of rhythm. Mr. Spencer has shown that all motion is rhythmical, and it requires very little consideration to recognise that all the functions of our bodies are rhythmical in their exercise, and rhythmical in their recuperation after exercise. From the fine rhythm of the separate muscular shocks that make up a muscular contraction, through the rhythm of alternate contraction and elongation of muscles in every muscular movement, to the rhythm of diurnal activity and nocturnal quiescence of all voluntary muscles; from the rhythm of cardiac pulsation and of respiration, through the rhythm of digestion and intestinal action, to the rhythm of sexual activity; from the menstrual rhythm to the rhythm of growth and decay, development and retrogression, life and death; every function of every animal organism is rhythmic in its activity.

A 50 lb. pendulum can be kept in motion by the impulse of an escapement of a fraction of an ounce in weight, if only the rhythm

of the escapement corresponds with the period of oscillation of the pendulum. A suspension bridge which could bear the dead strain of a park of artillery, may be broken by the march of a company of foot, if the step of the soldiers coincides with the period of oscillation of the bridge. A glass bowl may be shivered by singing at it, if the vibrations of the note sung coincide with the period of those of the bowl. All rhythmical motion may be increased indefinitely, if it be aided by impulses, however small, of equal rhythm. And since all the functions of the body are rhythmical, any rhythmical impulse incident upon it, that coincides with the rhythm of any of its functions, will reinforce that function, and so will be an occasion of pleasure, so long as the activity of the function is not pushed to exhaustion. But the different rhythms of function, if we take into consideration those of the nervous system, are indefinitely various; so that any rhythmical incident motion is sure to coincide with the rhythm of some function, and thus to be an occasion of pleasure; while interference with established rhythm, and incidence of arhythmical motion, is always disagreeable. The most obvious application of this principle is in the case of sound waves, the pleasurable and painful qualities of which have been so thoroughly worked out by Helmholtz and other investigators, that there is no need to reproduce them here. But in this place attention may be drawn to a further application of the same principle upon a higher plane. Not only are sounds pleasurable when their rhythms reinforce and corroborate each other, but the succession of sounds, to be pleasurable, must be rhythmical. In a musical air, the accent must recur with regular rhythm; and whatever the vagaries and variations of the melody, it must conclude upon the keynote, or it leaves upon the mind an unsatisfied sense of incompleteness. The rhythm must be completed if the occasion is to be pleasurable. It is the same principle that demands that a story that begins in calm shall end in calm, whatever the intermediate fortunes of the actors may be. We expect the drama of life to be rounded up and completed, and the final situation of the dramatis personæ to be one of permanence. The storm and stress, the troubles of the hero and heroine, the machinations of the villain, give us pleasure to follow, only if we are led through them to the completion of the rhythm in a state of tranquillity at the end. An unfinished story, one that leaves us in doubt as to the ultimate fate of the characters, is always disagreeable. Much better that the hero

should be killed, and the heroine relegated to a lunatic asylum, rather than that their fate should be unknown. This completion of an harmonious rhythm is the source of the satisfaction that we gain from the contemplation of tragedy. A funeral march must not end in a jig, and a sad story must have a sad ending, or the rhythm is shattered, and the incongruity jars upon us. The pleasure arises from the consistent return to the keynote. Somewhat similar in kind is the affection connected with the working out of a problem. We begin with our data and quæsita, and plunge into a strife of speculation which may carry us far away from our initial position. If we can return to it, if we can complete the rhythm, if we can round up the process, and end with a satisfactory demonstration, we are filled with pleasurable affection, but until this is done, there is always a disagreeable feeling of incompleteness. In all intellectual processes, the pleasure of orderly rhythm and the pain of defective or interrupted rhythm, are very marked and pronounced accompaniments. Of course, such pleasure is only a part of the pleasure that accompanies intellectual achievement, but it is an appreciable and distinguishable part.

AFFECTION AND ATTENTION

The connection between affection and attention has to be considered in two aspects; first according to the affection which is associated with the object of attention, and second with regard to the affection which accompanies the act of attention.

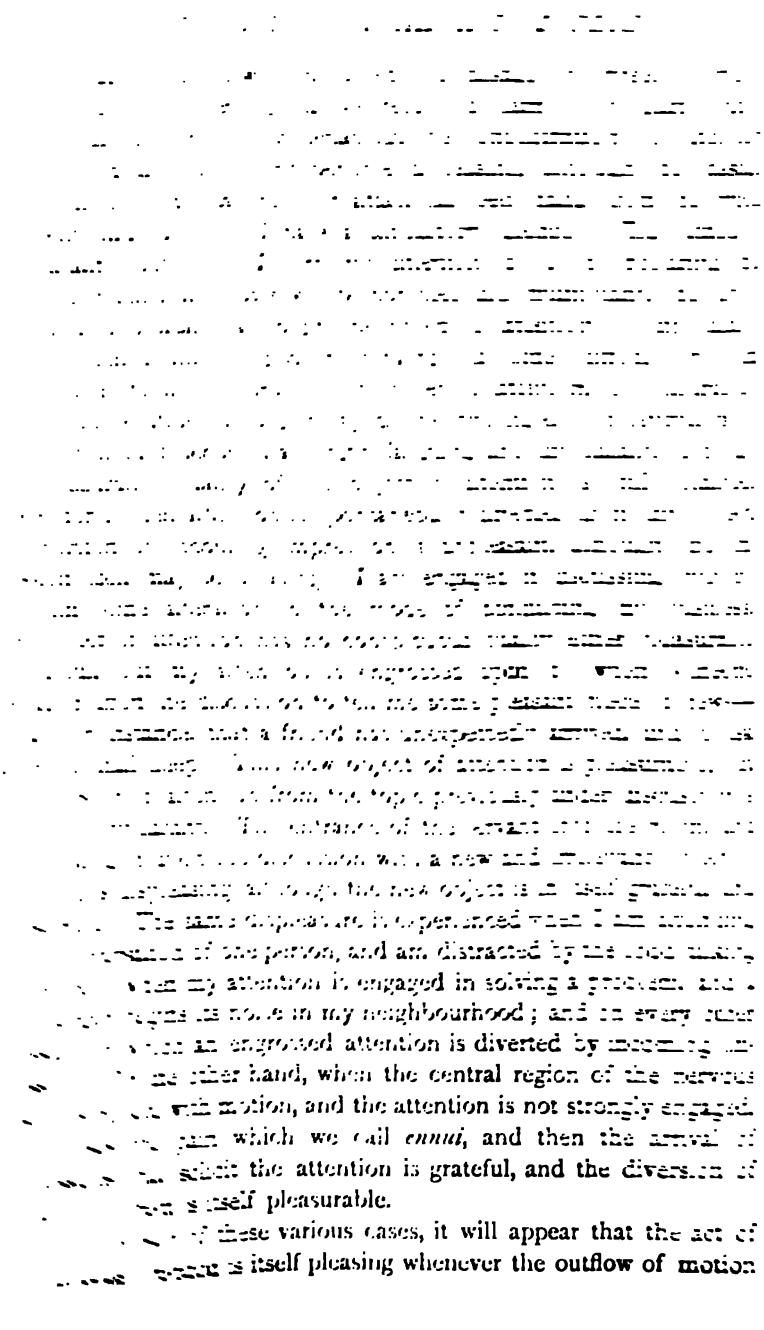
Reflex attention we have found to be attracted by any change of sufficient gravity among the ingoing currents, apart from the beneficial or harmful quality of the change in the circumstances, which the change in the ingoing currents represents; apart, that is to say, from whether the impression that elicits the attention is pleasurable or painful. It is the mere intensity of the impression that determines the attention; but since painful impressions are on the whole more intense than pleasurable, reflex attention is more often given to, and more steadily fixed upon, painful than pleasurable impressions; and, as a rule, the diversion of attention from pleasurable to painful impression is more frequent, and takes place more readily, than the transfer in the opposite direction.

Attention is greatly under the influence of emotion, and the object which arouses emotion never fails to arouse attention also. It is true

that attention to the object is antecedent to emotion, but the emotion, once aroused, confirms and rivets the attention upon the thought, which we have seen to be the basis of the emotion. The bodily state which accompanies emotion is enduring, and the mental state, which is the reflection of that bodily state, is correspondingly enduring; and so long as these endure, so long endures the pleasure or pain which makes the third element in the emotion. The affection, and the mental accompaniment of the bodily state, together make up a powerful mental impression, which reflexly solicits attention to the thought to which they owe their origin; and in this way reflex attention is powerfully determined by emotion; and this is true whether the emotion be pleasurable or painful. The painful emotion of fear determines the continuance of our attention to the fearful agent, quite as efficiently as the pleasurable emotion of joy determines the continuance of attention to the joyful event; the continuance of attention being determined, not by the quality, as pleasurable or painful, but by the strength of the emotion. In this case the rule is followed that reflex attention is determined by the strength of the stimulus.

With spontaneous attention it is otherwise. Spontaneous attention is determined largely by the pleasurable or painful quality of the object. Objects of attention that are pleasurable are pursued; attention is concentrated spontaneously upon them and lingers about them; the pleasurable quality of the objects of itself tends to maintain attention towards them. Conversely, painful quality in the object repels the attention, and though painful objects attract attention reflexly, they are never the objects of spontaneous attention. When attention is reflexly attracted to a painful object, the first exertion of spontaneous attention, so soon as spontaneity can assert itself, is to transfer the attention to a more attractive object. Say that we have been subjected to a snub; a painful emotion is aroused, which keeps the attention reflexly fixed upon the incident, until the weakening of the impression by the lapse of time allows spontaneity to assert itself. Then, if we are gifted with a sense of humour, the attention is transferred to some humorous aspect of the incident; and thereafter, whenever that incident recurs in memory, attention is repelled from the disagreeable aspect of the occurrence and is spontaneously transferred to its humorous aspect.

Apart from the pleasure or pain which is associated with the object of attention, the act of attention itself may have its proper quality of pleasurable or painful affection, which may or may not be of the same



with which it corresponds is of high spontaneity and is unobstructed. When the spontaneity diminishes, from depletion of the central store of motion, the spontaneous exertion of attention loses its pleasurable quality in proportion to the degree of depletion. When attention is spontaneously directed upon any object of attention, we may suppose that the passage of motion in the corresponding direction is unobstructed, and so long as no obstruction exists, or as the obstruction is minimal, so long the act of attention is pleasurable. When there is obstruction to the outflow of motion in the direction in which it is seeking exit, some degree of pain is associated with the act of attention, and is proportional to the amount of the obstruction. When the obstruction is overcome; when the problem is solved; when the missing word is remembered; then the painful quality disappears, and is replaced by pleasure. The diversion of attention by a distracting impression is equivalent to the interposition of an obstruction in the route of the outflowing motion, and is correspondingly painful; while the cessation of the distracting impression is equivalent to the surmounting of the obstruction, and is correspondingly pleasurable. If we seek the rationale of the pleasure and pain thus experienced, we must suppose, and the supposition is plausible, that the free and unobstructed outflow, of motion stored to repletion, is beneficial to the organism; while the conflict between an outflowing current and an obstruction occurring in its route, is disintegratory in its effect.

AFFECTION AND WILL

Between pleasure and pain on the one hand and Will on the other, there is a very intimate connection, but the nature of this connection has been variously stated by different writers. The old view, that Will is entirely determined by pleasure and pain, that it pursues the resultant direction determined by the attraction of pleasures and the repulsion of pains, is the view that *primâ facie* commends itself to our acceptance; but, as so stated, the doctrine is, I think, not quite accurate: and is in any case not sufficiently explicit or precise. The clearest as well as the most uncompromising statement of this position is that of Dr. Bain, which may be thus paraphrased. Pleasure is the concomitant and sign of an increase of vital power, so that, whenever pleasure is felt, the increase of vital power tends to exhibit itself in

increased action. Any action which results in pleasure is thus a cause of its own continuance; it feeds itself, and is continued and increased by the effect of its own activity. The accompaniment and sign of pain is, on the other hand, an abatement of the vital energies, which abatement, extending to the movements, brings them more or less to a standstill. This is the primitive aspect of the process in a primitive consciousness; but as intelligence developes, anticipated pleasure and pain will become associated with the idea of specific acts, and will aid or allay the acts with which they are respectively associated, so that in the result pleasure will urge us to begin and continue acts that have been found pleasurable, pain to avoid and cease acts that have been found painful. That this statement is in the main in accordance with the truth, there can, I think, be no doubt. That pleasure is the sign of an "increase of vital power," or as I should prefer to put it, of a victory, *pro tanto*, and for the time being, of integratory over disintegratory processes of the body, and a consequent increased capacity for action; and that pain is a sign of the reverse condition, there can scarcely be any dispute; and it is as indisputable that the state of body of which pleasure is the sign is generally more favourable to activity, and especially to prolonged activity, than is the state which is signified by pain; but that this increased or decreased capacity for action, which is signified by pleasure or pain, is the sole original factor in the connection between affection and volition is, I think, open to doubt; nor should I agree that this connection is adequately expressed by the statement that pleasure prompts to increased, and pain to diminished activity.

The position so well advocated by Dr. Bain has been attacked, especially by Mr. William James, with that somewhat excessive derision with which this writer is accustomed to treat doctrines with which he disagrees. "Important," he says, "as is the influence of pleasures and pains upon our movements, they are far from being the only stimuli. With the manifestations of instinct and emotional expression, for example, they have absolutely nothing to do. Who smiles for the pleasure of smiling, or frowns for the pleasure of the frown? Who blushes to escape the discomfort of not blushing?" etc. All this is utterly beside the question, which is the influence of pleasure and pain upon *voluntary* movements, or rather upon Will as evidenced by movement, and no amount of jeering, as to the prompting of reflex movements by affection, has any bearing upon the question at all.

"All the daily routine of life," says Professor James, "our dressing and undressing, the coming and going from our work, or carrying through of its various operations, is utterly without mental reference to pleasure and pain, except under rarely realised conditions. It is ideo-motor action. As I do not breathe for the pleasure of breathing, but simply find that I *am* breathing, so I do not write for the pleasure of writing, but simply because I have once begun, and being in a state of intellectual excitement, which keeps venting it in that way, find that I *am* writing still." This passage might well stand upon another page as an example of the *ignoratio elenchi*. It denies what was never asserted. It refutes what was never advanced. Of automatic and habitual, no more than of reflex acts, is it asserted that they are *immediately* prompted by pleasure or pain. Such prompting is asserted of Volitions only. The act of breathing is not prompted by pleasure or pain, in the sense that before each breath we deliberately represent the pleasure that we shall derive from a draught of air, or the pain that we shall suffer if we refrain from breathing; it is not a voluntary act, it is neither pleasurable nor painful, and in tracing the relation between affection and Will we have no concern with it in either connection. But let the passage of air to the lungs be obstructed; instantly pain is felt, and instantly this pain prompts to voluntary action—to deep inspirations, to a new attitude of body, to opening of the window, to seeking of medical aid. Another instance given by Mr. James is that of "a shy and unsociable man who receives point-blank an invitation to a small party. The thing is to him an abomination; but your presence exerts a compulsion on him, he can think of no excuse, and so says yes, cursing himself the while for what he does." This example is no longer *ignoratio elenchi*. It is a valid instance of a voluntary act which leads directly to pain. And if the position which Mr. James desires to confute were that we never voluntarily do that which will bring pain upon us, it would be a crucial instance to the contrary, and would demolish the position altogether. But that is not the position. If it were, it would not be necessary to bring against it such a rare and exceptional instance. Any voluntary act whatever, selected at random from among the commonest acts of daily life, would suffice to contradict a statement so absurd. No, the statement is that our voluntary acts are determined by the resultant of the attraction of pleasures and the repulsion of pains. In the instance just given, the pain of attending

the party is reproduced, and yet the man consents to go. He does not go without a struggle. The matter is debated in his mind, and if he consents to go under the compulsion exerted by the presence, it is because the instant pain of refusing overmasters the reproduced pain that he expects to suffer by acceptance. It is a common case of erroneous perspective,—of a smaller but nearer affection carrying the day against one that is greater but more remote—and differs in no important respect from the case of the child who will steal the jam at the cost of a whipping. "Such instances of *voluntas invita*," Mr. James goes on to say, "show not only that many acts cannot all be conceived as effects of represented pleasure, but that they cannot even be classed as cases of represented good. The class 'goods' contains many more generally influential motives to action than the class 'pleasants.'" At this I must confess myself fairly gravelled. The contrast between the pleasant and the good is indeed common enough in books intended for the nursery, but that a psychologist as acute as Mr. James should recognise in "the good" anything beyond "the ultimately pleasant" is indeed surprising. It will be unnecessary to follow Mr. James through the remainder of his examination of the influence of pleasure and pain upon Will, since the whole of it appears to be permeated by similar misapprehension; but while I consider that his attack upon the classical position has failed, I do not regard this position as wholly satisfactory, and Dr. Bain's statement of it seems in some respects open to improvement.

That pleasure does not always stimulate us into increased activity is an objection which Dr. Bain did not fail to recognise, and one which he endeavoured, not very successfully, to meet. "There are pleasures," he says, "that calm down our active excitement; as warmth, repletion, and the massive pleasures generally. But these cases still conform to the law. There is an arrest put on a painful or morbid activity; a new action or attitude is assumed in accordance with the pleasure, and is kept up and adjusted for increasing it to the utmost. We seem to be passive; but, in point of fact, repose is the essential condition of such enjoyment. Let anyone endeavour to drive us out of our quiescent and comfortable state, and our action would prove by the energetic resistance and return, how great is the power of the pleasurable stimulus. . . . The states of massive enjoyment, not acute, are accompanied with a gradual quiescence of nerve currents, in other words

they are of a soporific character; neither active exertions nor ideal longings are promoted by them." Now if these are the facts, and they undoubtedly are, it seems that, gloze them as we may, they are fatal to Dr. Bain's contention that the continuance in a pleasant act has its origin in the increase of "vital power" of which pleasure is the sign. The increased capacity of the organism for fulfilling its functions, the added efficiency, of which pleasure is the sign, will account very well for the continuance and increase of activity when activity gives pleasure; but the statement does not fit in well with those very numerous cases, some of which Dr. Bain gives, in which pleasure prompts, not to increased, but to lessened activities; not to action but to passion. And the corresponding difficulty in the case of pain is even greater. Pain is connected with "a decrease of the vital function." Its "primary and general influence is to abate energy." "The vitality is altogether lowered." Hence, when in the course of our activity we experience pain, the activity is at once abated, "as when we are stopped by a prickly hedge, or by knocking against a stone wall. The infliction of pain seldom fails as a cure for over-action." But here we are at once met by contrary experience. It is not when a horse is bolting that his rider applies the whip and spur. It is not the too-industrious schoolboy that is birched. A noisy child is not always quieted by a box on the ear, nor a howling dog by a thrashing. A blow on the pit of the stomach will produce quietude, it is true, but the pain of colic or toothache makes us groan and writhe. It rouses us into activity. This difficulty is fully recognised by Dr. Bain, but it is not fully met. All that he has to say is, that while the vitality altogether is lowered, "the state being one of irritation and unrest, movements of some sort are kept up." "The difficulty here lies in showing how pain can resign the function of abating the active energy, to take up the proper function of pleasure, and stimulate continuous exertion. My opinion is that the operating element in this case is not the pain, but *the relief from pain*, which is, in effect, pleasure." This is ingenious, but more ingenious than plausible. As far as we can gather from a direct interrogation of consciousness, nothing seems more certain than that the writhing and moaning of pain are directly prompted by the pain itself, and are executed with no intention or hope of gaining relief from the pain. That the writhing and moaning do give us a certain relief is undoubted, but the relief that they give is relief from the pain, not of the toothache or the colic, but of the excessive tension

of the energy set free in the superior nerve regions by
impression which is delivered there from the affected or
part of the general condition of misery is relieved, whil
remains. But if, as we cannot but admit both on *a priori*
teriori grounds, a large amount of motion is set free by
at the superior nerve region of an intense impression,
delivered there in colic or in toothache, then Dr. Bain's
clearly not in complete harmony with the facts. If that i
the influence of pain upon Will is not wholly, nor primarily,
sarily, a paralysing, but sometimes at any rate a stimulating
Dr. Bain regards the stimulating influence of pain as excep
it is scarcely justifiable to regard as exceptional an occurre
has been a basis of regular conduct among men and animals
immemorial, and upon which trades like those of the whip-m
spur-makers have been founded, and have flourished from
which the memory of man runneth not to the contrary.
consider that the violent movements, initiated by the smart of
serve a very definite and direct biological purpose; that
directly to carry the suffering individual out of the reach of th
of pain; and when we consider, moreover, that it is at least
ant that the organism shall escape from pain-inflicting agents
shall continue pleasurable activities; it is impossible to doub
stimulating effect of pain is not exceptional, but is at least a
and inherent and regular an effect as is the stimulating effect o
In so far, therefore, as Dr. Bain's hypothesis of the connectio
pain and Volition depends upon the paralysing effect of pai
reason to reject it.

My own opinion would be that the formula, that Will pu
resultant direction determined by the attraction of pleasure
repulsion of pains, is not a happy statement of the case, a
more accurate statement of the connection between affection
is as follows: Volition depends upon affection. When af
neutral there is no Volition. Pleasurable affection determine
to continue the existing state of action or passion. Painful
determines volition to change the existing state of action or p

That volition is determined by affection is quite in harmony
position, already taken up, that volition is the mental accom
of the outrush of motion from the supreme area of the nervou
which is determined partly by the degree of repletion of that

motion, partly by the amount of solicitation from ingoing motion, to which the central area is subject. That the repletion of the central area with motion is a condition of pain, is known to everyone who has suffered from *ennui*, and the pain of *ennui* is one of the strongest determinants of volition to change the existing state of passion. The impress of any mode of motion, in excess of the amount that can be readily assimilated, is always painful; and the solicitation of the arrival of excessive amounts of motion at the central area, is also one of the strongest of determinants to change the existing state of action or passion under which such excess of motion is being received. When motion is emitted in directions in which it encounters relatively great resistance, the conflict between the current of motion and the resistance encountered is disintegratory, and is accompanied by pain; and while, on the physical side, the encounter tends to divert the motion into a more permeable route, this is, on the mental side, the volition to change the existing state of action under the determinance of the pain. When the central area is deplete, and when, in this state of depletion, demands are still made upon it by incoming currents, these demands can be met only by a harmful disintegration of tissue; and thus arises the pain of fatigue and exhaustion, which directly prompts a volition to change the existing state of action for one of passion. On the other hand, when the central area is replete with motion, which finds free and unobstructed exit, the emission of this motion is accompanied by a very high degree of pleasure; and as, on the physical side, a full cistern with a free outlet will continue to flow, so, on the mental side, the pleasure will prompt to continuance of action. Conformably, when motion is received by the central region in amounts which are so proportioned to the amount in store, as to elicit an outflow duly proportioned to this amount, and not to trespass upon reserves that cannot be expended without a harmful disintegration of tissue, so long the outflow will continue; so long there exists an affection of pleasure; and so long the pleasurable affection will determine the volition to continue the state of action or passion which is found pleasurable. As soon as the state of action or passion ceases to be pleasurable, the volition to continue it ceases, but the state is not necessarily changed when the volition ceases. Not until the affection becomes painful does the volition to change it come into being. In states of affective neutrality, states that are neither pleasurable nor painful, no volition will arise, and the result, so far as the state of action or passion is

concerned, will be the same as that in which the affection is pleasurable; that is to say, the state will continue; but it will continue, not by virtue of active volition, but by absence of volition to change it. That is to say, the acting mechanisms will continue in action, until, by exhaustion of contained motion, their action becomes painful; when it will cease. Or, if the state of neutrality is a state of passion, then that state will continue until the occurrence of pain provides a motive to change it.

According to this view, pleasure never acts as a motive to change the existing state of action or passion; and if, as is here expressed, by pleasure as a motive is meant existing pleasure,—what may, by a somewhat forcible distortion of language, be termed presented, as distinguished from represented pleasure—this view will I think be found correct. It is true that volition to change the existing state is often prompted by the representation of pleasure *to be gained* by a change, but this does not vitiate the general statement. The representation of future pleasure, or of pleasure that is not now actual, so far as such representation is possible, is not necessarily, is sometimes not at all, pleasurable. It approaches closely to Desire, and in Desire there is always the rudiment of pain, sometimes the actuality of pain in a high degree.

A doubt has been thrown in the last passage upon the possibility of the representation of pleasure; and the direct and pure representation of the class of pleasures with which we are now dealing,—pleasures of the object-consciousness—is not, I think, practicable. Not only cannot we represent the pleasure purely, that is to say, apart from the circumstances in which it was experienced; but we cannot represent it directly, that is to say, we can only represent it by representing these circumstances, and then the pleasure arises. If I want to "represent" the pleasure that I felt yesterday at meeting an old friend, I must represent the circumstances of the meeting, the aspect of my friend, his demeanour and what he said, and upon this representation I experience, not a representation of the pleasure, but a present pleasure, which I may regard as the very pleasure that I felt when I met him, or as a new but similar pleasure, according to my metaphysical predilections. This pleasure is not, in a strict sense, represented. It is not represented in the same sense that the visible form of an object is represented in the absence of that object. In so far as the pleasure is reproduced, it is not represented but present. It is actual pleasure, the

same in quality and nature as the pleasure experienced when the circumstances were presented. Indeed, belonging as it properly does, to the subject-consciousness—to the subject issimus, or ego that feels, it would be a misnomer to speak of pleasure as presented to this ego. Rather it arises in the ego. It is in special and peculiar degree a part of the self. And what is true of pleasure is true also of pain.

This distinction is important, in view of the generally accepted doctrine that volition is determined largely, not only by present pleasure and pain, but by the representation of pleasure and pain. It is not denied that the efficient motive of action, or determinant of volition, is, in the great majority of cases, not pleasure or pain experienced here and now, but the representation that by certain modes of action pleasure has been secured or missed, pain avoided or incurred, in the past. All that is denied is that into this state of mind the representation of pain or pleasure enters. What is represented is not the pleasure or pain associated with this or that act, but the association of pleasure or pain with the act, which is manifestly a very different mental state. If, for instance, you decide to determine the present pleasure of reading this interesting book, and to undergo the pain of application to a repellant pursuit, it is commonly stated that the represented pain of the consequences of neglected duty overcomes the present pleasure of reading; but this does not appear to me to express accurately the mental process. That the present pleasure is experienced there is no doubt; but it is very doubtful whether the pain of the consequences of the neglect of duty is represented. In my own case, I am unable to say that any pain at all is represented or reproduced. What seems to me to be represented, and to determine my action, in relinquishing my book and getting to work, is not any affection of pain, present or reproduced, but the *knowledge* that if I continue in the one course of conduct the outcome will eventually end in pain, and that if I change it the outcome will be in pleasure. Even if it be admitted that the pain of the consequences of neglect of duty is reproduced at all, it must be admitted that the amount or degree of this pain is quite insignificant in comparison with that of the present pleasure, and cannot, therefore, of itself overcome that pleasure. If this view be correct, it seems that pleasure and pain are not the sole motives to action, but that thought also must be admitted as a determinant of volition; and if thoughts are the mental representatives of mechanisms, there is no reason why this should not be so. The thought into which a pleasure or pain enters as a con-

stituent,—the association between the representation of a course of conduct and pain or pleasure—appears to differ from other thoughts in the binding power which the pleasure or pain exerts upon the association. When a course of conduct has led to the experience of either pleasure or pain, the reproduction of the pleasure or pain, on representation of the course of conduct, is usually very feeble; but the link of association between the representation of the course of conduct and the pleasure or pain is very strong; and there can thereafter be no representation of the course of conduct without representation of the association between it and pleasure or pain. But we have already seen, in our examination of Thought, that a strong association between mental states is a strong Belief, and the association in experience, of pleasure or pain with conduct, leads to a strong Belief that conduct of that description in those circumstances will lead to the same affection. Thus it seems that volition is determined as well by Thought as by Affection, and that the particular species of Thought which is apt to determine volition is Belief, a result which is in entire harmony with our previous speculations.

There would seem to be an obvious reason and an obvious biological advantage in this arrangement for the determination of Volition. It is clear that if pleasure is the mental state corresponding with integration, and pain the mental state corresponding with disintegration, these affections can scarcely be reproduced; for we cannot, except by placing ourselves in the same circumstances, reproduce the processes of integration and disintegration on which they depend. It is clear also that it is much more important, for the regulation of future conduct in accordance with the welfare of the organism, that the association of past conduct with pleasure and pain should be strongly coherent, than that the pleasure or pain should be strongly reproduced. Pleasure or pain, however vividly reproduced, would have little effect upon the selection of the course of conduct with which in experience it had been associated, if the association were forgotten. The effect of such reproduction, in the absence of the association, would be to continue or to change the state of action or passion then existing at the time the pleasure or pain was reproduced, but would have no necessary tendency to determine the conduct in accordance with past experience.

The conclusions at which we arrive, with respect to the influence of pleasure and pain upon volition, are therefore: (1) That pleasure and pain affect volition directly when only they are present, and that then

pleasure determines the continuance, pain the change, of the existing action or passion. (2) That past pleasures and pains determine volition indirectly, by the cohesive influence that they exercise upon the Belief that the conduct, in the course of which they were experienced, is connected with them.

AFFECTION AND MEMORY

The connection, between pleasure and pain on the one hand and memory on the other, has to be viewed in two aspects: first, the pleasure or pain that may attend the process or act of remembering, and second, the degree in which, and the conditions under which, pleasure and pain can be remembered.

The pleasure or pain concerned in the act of remembering must be distinguished from the pleasure or pain that is associated with the thing remembered. Many years ago I had a pleasurable experience, which I have forgotten. A friend who was present at the time reminds me of it, and straightway I cast about to represent the scene and circumstances of the experience. I find it very difficult to do so; I grope about among reminiscences of the past, and, with considerable effort, I am at last able to represent some of the circumstances of which I am reminded. The act of memory, so far as it is an effort, is unpleasant; it is painful; but the object of memory, the thing remembered, is pleasurable. The act of memory appears to have no very strong association with either pleasure or pain, and in so far as it has any such association, it is pleasurable when carried on with ease and without check, painful when it is obstructed and accompanied by effort; and beyond this there is little to be said. As we find in other connections, the obstruction and diversion of nerve currents is attended by pain; their free passage through permeable channels by pleasure.

With regard to the second aspect of the connection of affection with memory, to the remembrance of pleasures and pains, we find that this remembrance is on the whole less vivid and less direct than is the remembrance of other mental states. Pleasures and pains cannot rightly be said to be represented, for the representation of a mental state implies that that state belongs to the object-consciousness, and that it is represented *to* the subject. But as pleasures and pains are

peculiar to the subject-consciousness, it is improper to speak of their representation to, though we may fairly speak of their reproduction in, the subject-consciousness.

Pleasures and pains are not easily reproducible directly, and their memories are more inseparably bound up with other memories than are those of any other conscious states. The pleasures and pains that enter into Emotions cannot be directly reproduced; they can be revived only by representing the circumstances in which they have been experienced—by representing the thought which holds the complex together; and the memories of other pleasures and pains are, as a rule, more easily reproduced indirectly, by first representing the circumstances, and allowing this representation to arouse the pain or pleasure, than directly and not through this medium. Moreover, while the memories of occurrences can be aroused without the reproduction of the pleasure or pain which those occurrences occasioned, the pleasure or pain cannot be reproduced without the memory of the occurrence also being aroused.

The pleasures and pains of Sensation are more readily reproducible, and more separable from their associates, than many other affections. They are not completely separable from the circumstances under which they have been experienced, but they are partially separable. We cannot reproduce the pain of cuts or of bruises without some representation of the sensation of being cut or bruised, but we can reproduce the pain without representing any particular instance of being cut or bruised. As with other memories, the degree of reproducibility of pleasures and pains depends largely upon their original vividness; and for this reason pains are more faithfully and enduringly reproduced than pleasures; and intense than voluminous affections of either sort. It is easier to reproduce the pain of being bruised than the pleasure of being stroked; easier to reproduce the more acute pain of being cut than the more voluminous pain of being bruised; easier to reproduce the more intense pleasure of a sweet taste than the more extense pleasure of a warm bath.

The pleasures and pains which enter into Emotions are neither directly nor separably reproducible. The Emotion, complex as it is, has its several parts so welded together, that in memory they are inseparable. When we have been in any terrifying circumstance; when, for instance, on the side of a precipice our foothold has begun to give way, we cannot thereafter remember the circumstances without

at the same time reproducing the pain of fear, neither can we reproduce the pain except by means of a representation of the circumstances. There is, however, in the case of Emotion, this peculiarity: that the representation of the circumstances calls up, not merely a memory of the pleasure or pain that we experienced during the first occurrence of the Emotion; it calls up the whole Emotion, and with it a pain or pleasure which is not a mere reproduction of that originally felt, but is now newly originated; or so it seems to me. A man is inadvertently guilty of some piece of *gaucherie*, the perpetration of which instantly brings to his face the blush of shame. He collides with a lady on the ice and knocks her down; he treads on her dress in the ball-room and tears it half off her back. When he gets home and thinks about the event, he again experiences the painful emotion of shame, and the pain that he now feels may be less than, or equal to, or even greater than that which he felt at the moment of the perpetration of the act. He may now remember that the lady's movements made her misfortune unavoidable, and that nobody but herself was in a position to observe his own share in the affair; and in this case his present pain is less than that he experienced at the time. Or he may now for the first time realise how completely he made himself the cynosure of the assembly, and may for the first time remember, or fully interpret, the unfavourable expressions of the onlookers; and in that case the present pain may be actually greater than that which he experienced at the time. This pain, then, can scarcely be remembered, for it is not in accordance with our use of the word memory to apply it to a reproduction which is actually more vivid than the state which it reproduces. Hence it seems that, in this case at any rate, the pain which is felt upon the reproduction of an emotion is not a mere reproduction of the pain felt when the emotion was first experienced. It is a renewal of the pain, a repetition, a recurrence; it is the same pain felt over again; or if, as has been plausibly contended, no mental state can ever be the same in all respects as a previous mental state, then we must say that it is not a remembrance or reproduction of the pain felt at the time of the occurrence, but a new and original pain.

In practice, however, pleasures and pains are very seldom reproduced. We can no doubt reproduce them if we deliberately set ourselves to do so, but in practice this course is rarely adopted. What we do actually remember when we speak of remembering

and when the instance is considered, it will, I think, be found
only that this can be done, but that it usually is done. A man,
has made his way in the world and become prosperous, looks
upon his early life, and remembers his poverty and privation,
thinks that he remembers also the misery that he suffered in
sequence; but in fact his affection during this retrospect is not
of pain at all. Pain has no place whatever in his mind; what
occupied, on the contrary, with the pleasures of self-gratulation
satisfaction at the contrast between his present circumstances,
by his own exertions, and the circumstances which he remembers
have been painful, but whose pain itself he does not reproduce. "Ju
fuit durum pati meminisse dulce est." "Sorrow's crown of sorrow
the remembering of happier things." The distinction between
reproduction of pain or pleasure, and the representation of
association between certain circumstances and the pain or pleasure
which accompanied them, is a valid and an important one, as appears
in the consideration of the connection between affection and volition.

FAULTS OF PLEASURE AND PAIN

Pleasure and pain, being neither mental processes nor the results
mental processes, but elementary states of mind, are not themselves
susceptible of disorder. The nearest approach to disorder of affection
would occur if a process of disintegration were to be the condition
a pleasurable state, or a process of integration the condition of a pain
but even in such an event, it is manifest that the disorder would reside

appear superfluous to those who are familiar with the joyous elation that accompanies the terrible disintegration of general paralysis. But, in the first place, this disintegration arises from internal bodily processes, is not actuated directly by external agency, and therefore its corresponding affection belongs with especial propriety to the subject-consciousness, and will be dealt with in that connection; and in the second place, when we do deal with it there, we shall find that, while in a certain sense the quality or sign of the affection is the reverse of that which by hypothesis it ought to be, yet in another sense it correctly mirrors the process which is actually in progress.

The relation between affection and sensation appears little liable to disorder. There are, it is true, certain tastes, as of olives, of oysters, and of other *bonnes bouches*, which are to some people distasteful and to others grateful, a peculiarity which we might explain by the supposition that to the first they are harmful and to the second beneficial, were it not that they may become, by a short apprenticeship, pleasurable to the very same person to whom their first taste was repellant. Again, the taste of certain beneficial edibles, such as quinine, is extremely repugnant, while that of very poisonous edibles may be either not repugnant, as in the case of tasteless ptomaines, or may be actually pleasant, as the yew is to cattle. Most of such cases are, however, readily explicable. In the case of very complex substances, such as the yew, and the pie or the sausage in which the ptomaines are contained, it is clear that, together with the noxious ingredients, there are others which are nutritive, and that it is the latter, not the former, which are tasted and are found to be pleasant; and in all the cases we may well believe that, in as far as they are pleasant, they are beneficial, and in as far as they are unpleasant, they are harmful; but that in these as in so many other cases, the complete equilibration has not yet been effected between the affection and the *ultimate* effect of the impressing agent. The noxious but pleasant-tasting substance is, no doubt, immediately to some extent beneficial, and to this immediate effect the pleasure is adjusted. Ultimately it is harmful, and, when its harmful action begins, there is no lack of pain in correspondence with its harmful quality; but while in the mouth it is not yet harmful, and while in the mouth it elicits no displeasure. Similarly with the case of quinine. Ultimately and on balance it is no doubt beneficial, but its benefit is not unmixed. Its action is primarily and in some degree harmful, and it is to the primary and immediate effect, not to the

secondary and ultimate effect, that the affection is adjusted. Mo
quinine not only is harmful except in small doses, but it belong
class of substances—vegetable alkaloids—that are generally poi
and that have occurred so frequently in experience that the affec
the taste has become adjusted to their ultimately harmful quality.

The cases of the ascetic, the flagellant, the voluntary marty
generally the self-sacrificer among the sane; and of the suicid
self-torturer, and the self-mutilator among the insane, are in no
disorders of the relation of affection to sensation. It may be th
painful sensations which they voluntarily undergo are compensa
pleasures of a higher order, but the sensations themselves are no
less painful. The ascetic would consider himself cheated of
of his merit were he not to experience the pain of his sensory al
tions and inflictions; and indeed, as familiarity dulls his sense of
painfulness, he is wont to increase their severity. The insane
torturer also suffers the pain corresponding with his self-in
injuries, but he is sustained under them by an exaggeration an
version of the same instinct of Duty. It is a mistake to suppos
such persons are so rapt in the prosecution of their design as
indifferent to the pain that they suffer, or rather, as not to suffer
full proportion of pain. I well remember the case of a lad who,
insane suicidal impulse, attempted to jump through a closed wi
and succeeded in getting all four limbs through separate panes of
His arms and legs presented a multitude of lacerations of the skin
when these were sewn up, he flinched so markedly at each insert
the needle, as to show that the pain of this sensation was experi
with rather more than less intensity than usual; and generally
insane self-mutilators do undoubtedly suffer the full proportion
pain of their mutilations. The only case that I am aware of in
mutilation actually appeared to give pleasure, is that recorde
Dr. Abraham of a lion in the Zoological Garden at Dublin, which
time to time gnawed off portions of its tail; but whether the anim
in fact derive any gratification from the act, or whether the tai
anæsthetic, or what its motive was, we have no means of kno
The fact that this is the only case that can be adduced, pointing
absence of pain in connection with sensations that should normal
painful, shows that such absence is extremely rare.

The association of pleasure with congruity, and of pain with
gruity of experiences, seems little susceptible of disorder. It has

indeed, frequently enough, that congruity and incongruity are unrecognised, and are even ignored when conspicuously displayed and forced upon the attention; but once admitted, it does not appear that they fail to give rise to their corresponding affections. A man will entertain with maximal coherence the belief that a certain existing state of things,—say a duty on corn, the disqualification of Catholics, the limitation of the franchise, the maintenance of an established church,—is of permanent importance to the welfare and even the existence of his nation. He sees this state of things altered—abolished. He sees the Corn Laws repealed, the Catholics emancipated, the franchise extended, the church disestablished, and he sees that, so far from the nation collapsing into ruin, or being diminished in welfare, its prosperity advances by leaps and bounds. It becomes wealthier, more populous, more healthy, more orderly, more prosperous in every way; and the incongruity between the event and the belief ought to put him to the pain of the destruction of his belief. But it does no such thing. The incongruity is not recognised; it is not admitted; it is denied. He refuses to pay attention to the overwhelming evidences of prosperity that crowd around him, and concentrates his regard upon the few isolated instances of misfortune that come to his knowledge. But supposing that he is amenable to reason, and that he can no longer blind himself to the incongruity between his experience and his belief, the pain of having the belief destroyed is acute, and does not subside until some other belief is established in its place.

Disorders of the relation between affection and thought resolve themselves practically into disorders of Emotion, and although, as has been shown, emotion is far from consisting solely of affection, yet, since normal emotion has been most appropriately dealt with under the heading of affection, the disorders of emotion will be most conveniently dealt with in this place under disorders of affection.

Emotion is very frequently erroneous without being disordered, that is to say, an emotion is experienced in circumstances which do not in fact justify the emotion, but which are erroneously apprehended; and the thought, which is the origin and basis of the emotion, being erroneous, the whole emotion arising out of the thought is also erroneous. Thus, I am walking along a lonely lane on a dark night, when I suddenly perceive a man standing over me with upraised arm, and immediately I experience an emotion of fright; but a further examination of the frightful object shows me that it is not a man

but the stump of a tree, and that the threatening arm is but a broken branch. At once the rectification of the thought brings about a rectification of the emotion which is founded on the thought; and the fright subsides. A mother receives news of the loss of her son's ship with all hands, and is overwhelmed with grief. Presently it is discovered that the name of the ship has been wrongly interpreted at the telegraph office, and that her son is safe. The emotion was founded upon an erroneous belief, and, in the correction of this error of thought, the emotion is readjusted. Such occurrences of erroneous emotion, which are common enough, are clearly not disorders of emotion, and do not need further consideration here. When, however, the error of thought is due to disorder of the thinking process, and is incorrigible,—when, for instance, a man entertains the delusion that he has lost all his money, and suffers from the corresponding emotion of grief,—there is disorder of emotion in a more accurate sense; but still it would appear as if the disorder of emotion were wholly dependent upon, and ancillary to, the disorder of thought, and that the removal of the latter would necessarily result in the recovery of the former. But this is by no means necessarily the case. Whether the unadjusted emotion depends upon the disorder of thought, or whether the erroneous thought arises out of a previous disorder of affection, it is not always practicable to decide, but it is certain that in point of time the disordered affection very often precedes the erroneous thought, and that we can witness the gradual growth and establishment of a delusion, subsequent to, and apparently arising out of, an affection for which there was no previous warrant, either in the circumstances of the individual, or in the erroneous appreciation of those circumstances by the individual. Thus, whereas, in normal emotion, the thought precedes the affection, in disorder of emotion the affection frequently precedes the thought. If a man has lost all his money, the thought in which he appreciates this state of his circumstances gives rise to an emotion of misery; if he has committed a crime against someone who is dear to him, the memory of the crime evokes an emotion of remorse; but in disorder of emotion we frequently witness the reverse order of events. A feeling of misery arises first, and is followed by the delusion of pecuniary ruin; a feeling of remorse arises and is followed by the conviction that a crime has been committed. The intimate connection between the thought and the affection is still exhibited in such cases, for the one never exists for

long without the other; but their order in time, and, as it appears, their causal relation, are reversed.

The fact that the affection, which is normally aroused by thought, can and does arise independently of the thought, appears to corroborate, if corroboration were needed, the view that affection corresponds with diffused bodily processes of integratory or disintegratory character. It is easy to see that the appreciation of some favourable or unfavourable relation of the organism to its circumstances may call up dim and voluminous memories, either individually or ancestrally derived, of integratory or disintegratory processes; and that these conscious memories are the affections in question. And it is not difficult to understand that, as memories may be reproduced in the reverse order of their originals—as we can say the alphabet backwards, and follow backwards the incidents of a journey,—so, in the case of emotion, the similar process of association may be reversed, and that when affection does arise, unsolicited by its appropriate thought, the thought should subsequently be aroused and cohere with it. That this thought should attain to such prominence and to such a degree of cohesion as to rise to the position of a Belief, is the real crux of the difficulty of accounting for these delusions; and the difficulty is one which admits of at any rate a partial solution by the application of principles already established.

It is very noticeable that, as a clinical fact, delusions at their first inception are always very strongly associated with pleasure or pain. When they are fully established, this association often weakens and even disappears, and the delusion appears, like other beliefs, to be freely dissociated from affection; but the first appearance of a deluded belief is always strongly associated with either pleasure or pain. It is always the constituent of an emotion. I cannot recall a single instance, in a long experience, in which delusion has arisen except as part of an emotion. When the delusion has been long established, then indeed the affective element often subsides, and then the belief has taken rank with other beliefs of long standing, as a mechanism or memory. It has become embodied in permanent structure, and in this stage it is not attended with pleasure or pain unless it is interfered with; unless, that is to say, it is brought into relation with incongruous experiences, and then the conflict is attended by pain.

When the lad who has just received his first appointment goes to take up his duties, he experiences, from the circumstance that he

has now taken rank among the wage-earners of the world, an emotion of pride, whose signs are very perceptible. The emotion soon wears away however, although the circumstances remain unchanged; and at the end of a year or two he can recognise with amusement the same manifestation of emotion on the part of his younger brother. When the young officer first dons his uniform and receives his first salute, he experiences a keen emotion; but by the time he has earned his captaincy, the uniform and the salute are both looked upon as bores. When the callow first offender is introduced into the dock, he is overwhelmed with a shame which is a matter of wonder and amusement to him on his twentieth appearance in the same position. The recruit goes into battle in an agony of apprehension, by which the veteran not only appears, but actually is, unaffected. In all cases, familiarity with a given set of circumstances diminishes the amount of emotion which those circumstances arouse; and, with a sufficient degree of familiarity, the emotion almost or altogether disappears, while the appreciation of the circumstances remains undiminished. This peculiarity is true in the region of the abnormal as well as in that of the normal. We have already seen what a binding influence affection has upon belief, an influence which is equally powerful whether the belief is correct or erroneous; and thus the fixity of delusions which arise in the morbid excess of elation or depression is accounted for; and we may expect to find, as in experience we do find, that, the greater the elation or depression at the time the deluded belief is formed, the more enduring and unalterable the delusion becomes. But as time goes on, the affection, in which the delusion had its origin, subsides. The elation or depression, the triumph or remorse, the pride or the fear, passes away; but the disappearance of the emotion does not, in the abnormal any more than in the normal, involve or imply the disappearance of the belief with which the emotion is associated. The veteran still appreciates that he is being saluted, and returns the salute accordingly, although he has long lost the emotion of pride which his first salute gave him; he still appreciates the dangers of the battle, and takes cover accordingly, though he has ceased to feel the fear that his first battle occasioned; and the lunatic still maintains that he is persecuted by telephonic influence, although the pain and terror in which that delusion had its origin have long passed away; still declares that he is King of England, although the elation out of which the delusion grew has long subsided.

Normally, as we have seen, emotion depends upon the formation of a thought; and subsequent to, and dependent on this thought, occurs a change of bodily processes, with its twofold mental accompaniment, — the special subject-consciousness answering to the specific change, and the general subject-consciousness of pleasure or pain answering to the general direction of the change towards integration or disintegration. In disordered emotion, the thought is not the first occurrence. The first occurrence is the change of bodily processes, which occurs spontaneously and without the provocation of circumstances, or of the appreciation of circumstances. In obedience to the bodily change occur the special subject-consciousness and the affection, which together make up an amorphous emotion, an emotion in which the intellectual element is absent. But this element is not long absent. Ere long a thought is conceived, of such a nature as to give form to the emotion, to supplement and complete it. Circumstances are imagined, such as, if they in fact existed, would justify, or would go far to justify, the emotion; and the cognition, the erroneous cognition, of these circumstances, gives to the emotion the form which was hitherto lacking; rounds it off and renders it complete. This cognition is delusion, and its association with a prominent affection gives it coherence, gives it permanence, such, that when the affection in time subsides, the delusion remains, stripped of the emotion which gave it birth. Such is the ordinary origin of a delusion. Whether it is the sole origin is doubtful, and must remain doubtful until the origin and growth of delusions in individual cases has been more carefully studied, and until our modes of investigating the states of consciousness of the insane are better organised. Undoubtedly, the normal process of thinking is carried on as much in the absence as in the presence of prominent affection; and undoubtedly, thoughts so formed attain the cohesion, which constitutes them beliefs, by other means than by the intensifying association with pleasure and pain; and there is no *a priori* reason to suppose that what takes place in the normal establishment of mental relations, may not take place in the abnormal variations also of that process, or that delusions may not arise apart from a previously existing amorphous emotion. No doubt delusions do, not unfrequently, occur in cases in which no very conspicuous emotion precedes or accompanies them; but it is much commoner to find them arising, in the way here indicated, as the outcome of a

more or less definite attitude of the subject-consciousn
with well-marked affection. The subject is dealt with i
on disorders of thought.

An unjustified and unadjusted emotion, that is to say
which is based upon an erroneous thought, is very com
would seem that, whether the thought were merely e
corrigible, in which case it would be a mistake only,
were incorrigible and delusionary, in either case the
origin of an unadjusted emotion would be an errone
We shall see presently that this is not so, but for the
chief concern is to draw attention to the great frequency
of emotion—of emotions, that is to say, which are no
justified by circumstances, but which, being unadju
circumstances of the individual, are incapable of readjust
emotions are, of course, insane; and disorder of emo
common in insane persons; nor is the disorder restricted
of emotion, nor is any class exempt from disorder; but
generally, that the emotions in which disorder is most fr
played are those which are most fundamental, namely, the
and the reproductive, the grievous and joyous; while the
latest origin—justice, benevolence, ludicrousness, indignati
feeling—rarely suffer disorder, though they easily and
diminution and loss. Those which occupy a middle pl
religious emotion, are as often disordered as simply defe

Whether the disorder of emotion begins as erroneous
of which the erroneous emotion arises; or whether
erroneous feeling, upon which error of thought is grafte
case, the first event in the disorder is disorder of bodily
the first case, the seat of this disorder is clearly in the hig
of the brain, in which the changes that underlie the process
are carried on. In the second case, there are two alter
primary bodily change may, as in the last case, be in t
nerve regions, but in a set of processes different from thos
with thinking, that is to say, in the processes, whatever th
which underlie the mental phenomenon of emotion; so th
of the normal excitation of these processes by the process
they are started into activity in some other and abnorma
the emotion, consequently, is experienced apart from
basis of belief upon which it ought to rest. But there

conceivable mode in which emotion may originate. Of the threefold mental state which enters into the composition of emotion, one, the most voluminous and predominant, is that which answers to a definite change of metabolism throughout the greater part, it may be the whole, of the body outside the nervous system. It is conceivable that this bodily change, instead of being secondary to the nerve processes that underlie the thought or belief which forms the basis of the emotion, may occur primarily and independently, and that, consequent upon this bodily change, the voluminous mental state may normally occur; and in that case the whole of the emotion, minus the thought, will be experienced in its normal order, and the abnormity will be antedated from the occurrence of the nervous change to the occurrence of the metabolic change. The last hypothesis seems to be a very unlikely one, for the widespread bodily changes are co-ordinated changes. They fit in together, and are proportioned to one another; and it is therefore extremely unlikely that they should take place except under the guidance and provocation of a co-ordinated innervation. It is most probable, therefore, that the primary disorder is the disorder of central nerve regions, and that, whatever metabolic change takes place, is secondary and consequent on that. How the nervous process comes to be disordered, what is the agent that produces the disorder, and what the nature of the disorder, we do not know. We may shrewdly suspect that in many cases, if not in all, the operation of a poison is concerned in the process, but beyond this vague speculation our present knowledge does not enable us to go.

Beyond that disorder of emotion, which consists in its occurrence in the absence of any external justification in the circumstances of the individual, there is disorder which consists in defect and in excess of emotion, estimated with reference to the circumstances of the individual. Emotions are most powerful in youth, especially those which are pleasurable, and as age advances, emotion diminishes in volume and intensity. In states of deep and even moderate dementia, in which the higher layers of the superior nerve regions are peeled off as it were, and either destroyed or inactive, the emotions share in the deprivation that is suffered by the other higher mental processes, and disappear or greatly diminish. It is impossible to frighten a pure and deep dement, to evoke from him any manifestation of anger, or joy, or grief, or any other emotion. If we can make him understand that the house is on fire, the knowledge will not make

him hurry. If we tell him of the loss of his children, or even of his dinner, he receives the news with placidity.

On the other hand, there are persons within the pale of society who are prone, if not to experience emotions with exceptional intensity, at any rate to manifest them with exceptional vivacity. Judged by the standard of the average person, the manifestations of these emotions are exaggerated. They display a greater appearance of anger, of grief, of joy, and of other emotions, than equivalent circumstances would evoke from the majority of men. Such persons are sometimes termed "emotional," though this term is not often used in any precisely defined meaning. Whether this exaggerated manifestation of emotion is merely an excessive manifestation of a normal volume of emotion, or whether the persons who exhibit it do really experience a greater volume and intensity of emotion than other people, we have no means of knowing; but it is usually considered, and not without reason, that the former is the case. It seems to be assured that the outward and active manifestation of emotion is by no means an accurate index to the strength of emotion that is experienced, but that the connection between feeling and display is largely a matter of habit. There are those who train and accustom themselves to control and suppress the manifestation of emotion, and look upon such manifestations as signs of weakness to be despised; while others again, if they do not intentionally emphasise the display of emotion, at any rate exert no inhibition over it. The fashion to the one or the other mode of conduct prevails in communities, and even, it is thought, in races of men. Certain it is that, in this country, the expression of emotion is less restrained among the lower than the higher social grades, and much less among the Irish and the Hebrews than among the Teutonic members of the community. Unrestrained expression of emotion, and probably exaggerated intensity with which emotion is experienced, are common in certain forms of insanity. In the mania of old people, a second childhood occurs, marked by the same unrestrained expression of emotion, by the same rapid alternations of emotion, as occur normally in the child. Such people rave and storm with anger, melt into tears, break into loud and unseemly laughter, are indignant, jocular and pitiful, all in the compass of a quarter of an hour; and in the transitoriness, no less than in the excessive expression, of their emotions, they exhibit a departure from the normal.

Lastly, there is a disorder of emotion, or at any rate of its expression, common enough in the insane, in which the degree of emotion that is experienced appears to be in excess, not merely of the circumstances that actually do exist, but of those that are deludedly supposed to exist, or of any that could exist. The sustained groans and outcries of a melancholy person who believes that he has lost all his money, and has an abscess at the root of every tooth, express a degree of misery greater than even these circumstances would justify, and greater than would be considered justified by any circumstances, however adverse, that could be imagined. So, too, the exultation of the general paralytic is so overweening, that there are no possible circumstances by which it could be justified; and in order to bring the cognitive element up to the level of the rest of the emotion, circumstances have to be imagined that are altogether preposterous.

It is very noteworthy that some proportion between the cognitive and the other elements of the emotion is usually observed, and is observed in abnormal as in normal emotion. In normal emotion, the belief that certain circumstances exist, arouses an emotion, whose quality and magnitude are determined by the circumstances that are believed to exist. In abnormal emotion, a certain magnitude and quality of emotion is experienced, and circumstances to match are imagined and believed to exist. There is always a certain congruity between the quality and magnitude of the feeling, and the quality and impressiveness of the circumstances that are imagined to correspond with it. The depressed person does not imagine that he is more wealthy, more successful, more prosperous, than he actually is, but that his circumstances are in harmony with the quality of his feeling; and the greater his depression, the greater the disasters under which he believes that he labours. So, the exalted person does not imagine that he is less wealthy, less successful, less prosperous than he actually is, but that his circumstances are such as to justify his feeling; and the greater the magnitude of his emotion, the greater the prosperity that he attributes to himself. When the magnitude of the feeling is very great, the imagination struggles to attain a corresponding impressiveness in the circumstances, and the result is often extraordinary. The depressed person imagines that he is financially ruined, that he is eaten up by disease, that he is morally depraved, that his body is in imminent danger of arrest and torture, and that his soul is irrevocably damned. The extravagances of the elated patient are even more grotesque. He

evidently futile to combat the delusion by argument, or by the ... of its incongruity with other beliefs. Were the delusion a ... error of thought, its dissipation by process of thought might ... be expected; but since it is an error of thought secondary to, and ... sequent upon, erroneous emotion, it is only by rectification of ... emotion that the delusion can be removed. Our ignorance of ... and nature of the physical disorder that underlies disorder of ... must render this task a very unhopeful one at present, but in the ... time, there is some small satisfaction in finding that the useless ... attempting to reason a person out of a delusion, so long established ... practice, is to some extent explicable, and that the attempt may ... scientific as well as on empirical grounds, properly be abandoned.

DISORDER OF THE RELATION OF AFFECTION TO ATTENTION AND VOLITION

Normally, as we have seen, Voluntary Attention rests upon ... lingers about objects that are pleasurable, and is repelled from ... that are painful; and whether this relation is modified in pathological states is doubtful, or rather, is dependent upon the position of the line that we place between spontaneous and reflex attention. There is no doubt that in states of melancholia the attention is concentrated upon painful objects, and the question, whether this attention should be looked upon as voluntary or as reflex, is largely one of nomenclature. In the common acceptance of the word, it is no doubt voluntary or spontaneous, since the circumstances upon which it is ...

ing of words, we may look upon this as an instance of reflex attention, and decline to regard it as one of alteration of the relation between affection and voluntary attention, for, that reflex attention may be normally concentrated upon a painful object, we have already determined.

That pleasure determines volition to continue, pain to change, the existing state of action or passion, receives from morbid states contradiction which I believe to be apparent only. In melancholia, not only is the attention concentrated upon painful objects, but it appears that the state of action or passion which is painful prompts, not to change, but to continuance of the state. The melancholic seems in many cases to hug his misery; to seek and ensue it; to add to it, and intentionally augment it. He refuses to be comforted; he seeks opportunities of discomfort; he refuses to eat; he prefers the hard floor to a soft bed; he injures and mutilates himself; his sole object in life seems to be the infliction of pain upon himself. But for all this, I do not think that the fundamental relation between affection and will is altered. That pleasure has become abhorrent and pain a thing to be desired seems a contradiction in terms. It is equivalent to saying that pain has become pleasure, and *vice versâ*. That melancholics do in fact suffer pain from the injuries that they inflict upon themselves, there is not the slightest doubt; and the avidity with which they crave for injury, mutilation and destruction, is to be accounted for, not by any attraction that these painful processes have for them, but by an overmastering motive of the same nature as that which dominates the ascetic, and which leads the fakeer into such excesses of self-denial and torture. The dominant note of the consciousness of the suicidal melancholic is the same as that of the ascetic It is the conviction of personal unworthiness, associated with which is an exaggerated and distorted sense of duty; and as the normal sense of duty prompts to self-sacrifice, and the disregard of, or submission to, the immediate pain that ensues from acts of rectitude, so this exaggerated and perverted sense of duty prompts to greater sacrifices, to a more complete disregard, to a more serene submission to the pains that are incurred in its pursuit. How this exaggerated sense of duty arises; of what normal process it is the caricature; will be more appropriately examined under the head of Conduct; for the present it is enough to notice that we have, in the self-destructive propensities of the melancholic, no primary disorder of the relation between affection and will, but a course of conduct which is the normal outcome of an abnormal belief.

SUBJECT-CONSCIOUSNESS

How each individual differentiates himself from the rest of the universe; how he proceeds to differentiate an inner self or mind from the body which it inhabits, or in which it inheres; has already been displayed in the Introduction. We have now to note that the process of the shrinkage of self does not end here, but that, in the mind also, there is a further differentiation. There are, in fact, at least four stages of successive differentiation or abstraction of Self; four meanings which may be attached to the word, viz.:—

1. The self as mind-body, distinguished from the external world, which is recognised as both material and as containing other minds, all external to the body. This is the crude self, or personality of primitive concepts and of ordinary discourse.

2. The self as the mind, distinguished from the body. This I take to be the soul or spirit of theologians, the immaterial as distinguished from the material self. It constitutes also the personality of psychologists.

3. The mind, being contemplated, is discerned to be differentiable into the subject which feels, thinks, wills, and remembers, as distinguished from the object, which consists of the sensations, volitions, thoughts and memories that are presentations to the subject or inner mental self. This self we may term the Subject.

4. In thus contemplating the mind as duality, not only the object or presentation, but the subject to which presentation is made, are both objects or presentations, or are a combined subject-object presentation, to an innermost subject or self which contemplates them. This subjectissimus retains its superlative subjectivity so long only as it is in the attitude of contemplation. As soon as it is ousted from that attitude, and is itself contemplated, it changes its character, it becomes the mere subject or subject-object, it is an object of contemplation to the subjectissimus, which still endures.

The personality, or self of ordinary discourse, is a very complex affair. It consists, not of body alone, but of feeling, thinking, acting body; not of mind alone, but of mind acting upon and acted on by the external world through the medium of the body. The first primitive concept of self consists of mind-body in inseparable conjunction. It is by no means displaced by the subsequent more abstract concepts of

self, but remains alongside of them, as the concept of the rising and setting sun remains alongside of that of the revolution of the earth; and the one concept, like the other, is kept for use in the practical service of life. With the material partner in this union, the psychologist is not directly concerned. He is not concerned with it in and for itself. He is concerned with it only as it is an intermediary which traffics between the mental self and the external world. Its structure and functions he leaves to the consideration of the biologist in his various departments,—to the anatomist, the physiologist, and the physician. All that the psychologist, as such, is concerned with is, first, the relations which, through the body, are maintained between the mental self and the external world; and second, the relations that the bodily self maintains with the mental self. The first have already been dealt with in the preceding portions of this book. The second we have now to consider.

Hitherto we have spoken of the bodily self and the world outside of it, as if there were between them an absolute distinction. But on closer and more vigilant inspection it is seen that this is very far from the case; and the more we examine the borderland between them, the more is the latter enlarged at the expense of the former, the more does the bodily self shrink under the encroachment of the external world.

The food on the table is certainly no part of the individual who is about to eat it. It is no part of him when it is in his mouth. Trace it onwards into the stomach, and it is still no part of him. There are organisms in the shape of a simple sac, which we can turn inside out, when the stomach becomes skin and the skin becomes stomach. Clearly, in such a case, what is inside the stomach is no more a part of the individual than what is outside the skin. It lies in close contact upon all sides with the individual, but it is in no proper sense within him. It is no part of him. If this is true of food in the stomach, it is true of food in the intestine, and of the other intestinal contents,—of the bile, the gastric and other intestinal juices. They are surrounded by the organism, but they are no part of it, neither when they are in the intestine, nor when they are in the ducts leading to the intestine, nor when they lie loose in the glands, nor even when they are in the cells of the glands, waiting for extrusion into the ducts. If we pursue our analysis still further, we may regard the blood in the vessels and the plasma in the tissues as, in a sense, without the organism. It is true that the individual dies if the blood

only cannot he move it except as he would move a [illegible]
but it does not obey the central influence even in regard to
nutrition. It is a law to itself. To him it is extra-corporal, and
for the sentimental regret of parting, he is better without it.
when it is removed—when it sphacelates and separates—he is
there. He is a man without an arm, but he is still a man.
then, in this intricate mingling of self and not-self, are we to
the distinguishing line which separates the one from the other?
answer is clear. The individual is summated and represented
the highest nerve regions. All parts of the body that are there
sented belong to the self. All parts that are not there represented
are adventitious to the self. The individual extends as far as
nervous communication with his highest nerve regions extends;
beyond this is outside of him in the technical and exact sense.
is sometimes said of a woman that she is a bundle of nerves.
literally true that both men and women are, from a psychological point
of view, bundles of nerves. Down to the extremest ramifications
every nerve fibril the individual extends. Beyond that is not
of him. The sensation of light corresponds with the impact
luminiferous waves, not on the cornea—the physiological surface
the body—but on the retina, the psychological surface. The sensation
of taste corresponds with the action of sapid fluids, not on the mucous
membrane, but on the nerve endings. It is not until the nerve is
reached that the individual is reached; and if the nerve is severed
the communication with the centre is interrupted—the impact of
light waves on the retina, of sound waves on the ear, no longer
evokes any answering sensation; for the motion from without

which impinges upon these nerve-fibre endings comes from without him—from without his very self. Whether this motion takes its origin in a star so distant that it has to travel for centuries before it reaches him, or whether it arises in the close-packed cells that cluster round the nerve endings, it equally comes from without that very inner bodily self with which psychological reasonings are concerned.

Here, then, is another field of those actions and reactions between the individual and his surroundings—between the self and the not-self —with which mental states correspond. At every sufficient impact of motion upon a nerve ending, a corresponding sensation arises. The motion may come from a distance—from without the physiological as well as the psychological limits of the individual;—or it may come from that intermediate limbo which is within the one but without the other. So that, to the interchanges of motion and corresponding mental states that have already been considered, have now to be added a new set of interchanges, with their corresponding states.

The bodily self, with its varying states and processes, is presented to the mental self in two ways, therefore. It is known as the external universe is known, through the medium of the special senses, as an object of perception, of observation and of inference; and it is known by an interchange of motion that is effected, not intermediately through the special sense organs, but immediately between the various parts of the body and the supreme nerve regions.

When it is said that the body is known as other parts of the external universe are known, the statement is true, but is not the whole truth. There is a most important addition to the means we have of knowing our own body as an object of observation, over and above our means of knowing other such objects. The special senses act as intermediaries between the bodily self and the mental self, precisely as they act between the world beyond the body and the mental self. I see my own movements, I hear my own voice, I touch my own limbs, I pinch, squeeze, hit and rub my own body; and in this way I gain a knowledge of it precisely as I gain a knowledge of other bodies. But there is something more than this. In all these observations upon the body itself, there is the unique experience of a double sensation following upon a single volition. When I move, I not only see my own movements, but I have sensations from muscles, tendon, cartilage and skin, precisely corresponding, so far as correspondence is possible, with the volition on the one hand and with the vision on the other. When I

speak, the same volition that brings me the sensations of vocal movements, brings me the sensations of vocal sounds. When I touch my arm, the same volition that brings me sensations of touch in my fingers, brings me sensations of touch in my arm. The immense importance of this double effect of volition, and the part it plays in the origin of our fundamental concepts of Space, Time, Motion and Matter, and especially of Subject and Object, of Self and not-Self, are they not written in Mr. Herbert Spencer's *Principles of Psychology*, vol. ii.? and to his exposition nothing useful can be here added.

Allied to the knowledge thus acquired, and derived, like it, from ordinary volition and the special senses, is that knowledge of the bodily self that the mental self gains by inference from observations on the bodies and conduct of others. It is thus that we gain a knowledge of our own anatomical structure, and that we infer, in ourselves, the same dependence of character upon structural arrangement that we infer in other people.

The second way in which the bodily self is known to the mental self is by the interchange of motion, not indirectly through the intermediation of the organs of special sense, but directly. From every origin of an afferent nerve, impulses, waves, currents,—whatever we may picture to ourselves as the form of the motion that passes through the nerves,—are carried centrewards. To every terminal of an afferent nerve, a similar passage of motion takes place centrifugally. The proximate place of meeting and redistribution of these fasciculi of motion is in ganglia of low rank, and it is in such ganglia that the proximate adjustments of ingoing and outgoing motion are made. But it may be safely asserted that in no case is this humble ganglion the ultimate authority in this regulation and redistribution. In every case it makes its reports to, and receives its mandates from, a centre higher in rank; and the ultimate authority, to which every primitive ganglion is in the last resort subservient, and by which it is regulated, however indirectly, is that supreme region of the cerebral convolutions whose action is accompanied by mental phenomena.

In earlier works I have brought forward evidence of this subjection to the highest nerve regions,—to what are sometimes very inadequately and incorrectly termed the "intellectual centres"—of every bodily process, from the secretion of tears and the rapidity of the heart's action, down to the general diffused process of metabolism throughout the body. I do not think that such demonstration is any longer neces-

sary. I do not think that any competent physiologist would dispute the ultimate regulation of every bodily process, the co-ordination of all bodily processes, by a single central authority. It seems that the onus now lies upon those, if any there be, who dispute this doctrine, to give a reason for the faith that is in them, and to show how, upon any other hypothesis, the indisputable co-ordination of process takes place. How is it that the symmetry and proportions of the body are arrived at and maintained; how is it that the legs are equal in size; that the arms also are equal; that the arms and legs are proportioned to one another and to the rest of the body; that every structure and organ in the body, and every process in every structure and organ, is proportioned to every other? How is it that, when the convolutions of the cerebrum are damaged, these due proportions are not maintained, that one arm or leg ceases to grow, or, if full grown, undergoes profound alteration in nutrition? How are all these occurrences to be accounted for, if there is not a central bureau, in which all the bodily processes are maintained in due proportion to each other, and in due subordination to the whole?

With this interchange of motion between the supreme nerve regions and the body at large, there correspond two very different modes of consciousness, and the first mode is altogether analogous with that which arises during the interchange between these same regions and the world outside the body. This constitutes the subject-object-consciousness, as I have called it; states of consciousness which belong to the object-consciousness in so far as they are presentations which are contemplated by the subject, but which belong to the subject-consciousness in respect that they are identified with the self, in a manner and to a degree which does not obtain with those modes of object-consciousness, relating to our traffic with the world outside of our bodies, which we have already dealt with at such length. States and processes of consciousness of this mode or class are divisible into sensations, thoughts etc., of the subject-object-consciousness, and may be dealt with in the same way as corresponding states and processes of the object-consciousness. They are received in consciousness and there dealt with,—assimilated, classified, interpreted, resolved. They are presentations to the subject, which exercises its activity upon them.

The modes of consciousness, as they have been provisionally called, of the other order, are very different. Strictly speaking, they are not modes of consciousness at all, if by consciousness we understand presentations. They no longer pertain to the subject-object, but are modes of the subject itself. When the body initiates relations of this

order with the mind, there is not a gaining by the mind of a knowledge of the body; there is a colouring or modification of the mental self directly, and without the intermediation of any process of thought. When, for instance, digestion is proceeding actively and normally, we do not perceive or know anything of the processes that are going on in the stomach. We may not have any sensation referred to the abdomen, or any addition to, or modification whatever, of the object- or subject-object-consciousness. There may be no new presentation whatever for the subject to attend to. But yet the mind is not the same. There is a satisfaction, a contentment, a luxuriousness, which was not present before, and which even now is not presented. It does not belong to the region of presentation. It is a modification of the self—of the subject-consciousness. We cannot perceive, or know, or analyse it, or subject it to any cognitive or contemplative process. All that we can properly predicate with regard to it is that it is there, or rather, that it is *here*. It is in me. It is part of my inner self. The addition of this to my self has made me different from what I was before it was added. But I do not even know this yet. If I think about it; if I know the difference; I must first have got it into the region of thought,—I must make a presentation of it; I must project it on to the object-consciousness. I must no longer merely be satisfied, but I must project this satisfaction outside my very self, which then contemplates an objectified image of itself which is not itself. So, I cannot see my own eyes. I must have recourse to a mirror; and what I see in it is not my own eyes, but an externalised image of them. This undifferentiated modification of the subject is the nearest experience that we have to pure sensation—to sensation free from all element of cognition.

There are therefore three classes of relations maintained between the bodily self and the mental self. In relations of the first class, the bodily self is presented to the mental self indirectly, through the intermediation of the special senses. In the second class, the bodily states and processes are directly presented to the mental self, without intermediation of the special senses; and in the third class, the bodily self directly modifies the mental self without presentation. The first of these classes I do not propose to investigate, for this task has been sufficiently performed by others, and in especial by Mr. Herbert Spencer. I now proceed to the investigation of the others, which merge and fuse into each other, and do not admit of separate treatment.

SENSATION

The modes of motion, occurring in the body itself, which impress the nerve endings, are both molar and molecular; and the sensation evoked differs according to the mode of motion. Of the molar motions occurring in the body, some take place in, and are communicated to the afferent nerves of, the motor apparatus by means of which the body acts upon the external world—the muscles, tendons, bones, joints, ligaments, etc. Others take place in, and are communicated to, the nerves of the viscera which subserve the vegetative life of the body; and the sensations may be divided into two classes according as they correspond with the one or the other of these two sets of motions. Lastly, a third class of sensations correspond with the nature and degree of the molecular motions that take place in the tissues of the body, and that are communicated to the nerve endings, and so find their way to the highest nerve regions.

The first of these classes of motions, and of corresponding sensations, occupy a peculiar position. The molar motions of the motor or locomotor apparatus are the means whereby the individual acts upon the outside world. Consequently, the sensations which accompany and correspond with these motions are bound up inseparably with, and form part of, the experiences of this action. Here an addition has to be made. No bodily movement can occur without a movement of the skin—a stretching of it in one part and a relaxation of it in another. So that these variations in molar movements of the skin have to be added to the movements of the motor apparatus, and the general consensus of motion has its corresponding sensation. Sensations of this class belong, therefore, partly to the subject-consciousness and partly to the object-consciousness. They correspond partly with the movements of the body itself and partly with the action of the individual on the external world. They form the uniting link between the subject-consciousness and the object-consciousness.

While it is possible to analyse the differences in these several modes of motion—as movements of skin, approximation and separation of the attachments of muscles, strains on tendons, and pressures on opposed joint surfaces, and the several modes of sensation which correspond with them—yet, for the purpose of a rough analysis, such as is required

here, it is enough to lump them together, and to notice that the intensity of the sensation corresponds with the vigour of the action. The duration of the sensation corresponds with that of the action. The massiveness or extensity of the sensation corresponds with the area of the action,—the magnitude of the part of the body involved in it.

With the molar movements of the viscera a different class of sensations correspond. The chief of these is the peculiar and characteristic sensation that accompanies distension of a hollow viscus. Distension of the lower colon and rectum, of the bladder, of the stomach, is in each case accompanied by its own characteristic sensation. So, too, is discharge of the contents, with contraction of the viscus, and relaxation of its sphincter. In the case of the stomach, sudden and excessive contraction is accompanied by the characteristic sensation of nausea. Movements of viscera that do not discharge their contents externally have no accompanying sensation. No useful purpose can be served by the acquisition of such a sensation, and therefore no such sensation has been acquired. Had it been as important to the welfare of the individual to be aware of the distension and emptying of his gall bladder, as of the distension and emptying of his urinary bladder, no doubt the sensations accompanying these conditions in the one would have been as vivid as in the case of the other.

Lastly, there are the extremely important sensations that correspond with molecular movements taking place in and about the nerve endings, and communicating this movement, through the nerves, to the highest nerve regions. These are the movements of metabolism, of the building up and breaking down of tissue. With movement in the first direction corresponds the sensation or affection of general well-being, of high spirits and jollity; with movement of the second order is associated the feeling of general gloom, of misery, depression, unhappiness; and according as the one process or the other preponderates, so will be the general mental tone. It will be at once apparent that, as there is but one way of anabolism—but one way in which the repairing and building-up process can be well and duly performed, there can be but one mode of sensation of the first class, though there may be many degrees of that mode. But there are several ways in which a process may fail to be properly performed, and we are therefore not surprised to find that there are several different modes of general misery, corresponding with these several modes of failure of, or interference with, metabolism.

When metabolism fails for lack of pabulum, there arises the sensation of hunger. When it fails from the lack of sufficient dilution of the pabulum, there arises the sensation of thirst. If it be not water, but oxygen that is lacking, in the material presented to the tissues, then the sensation of breathlessness arises. We are here confronted with a fact to which we shall have occasion to emphasise later on, namely, that the pure sensation, the mere modification of the subject without presentation, which has been dealt with on page 494, and of which the sensations with which we are now dealing are the type, is a very unstable condition; that is to say, it is rare in its pure form, and soon and easily loses its simplicity and becomes complex, owing to the introduction of presented elements—of states of object-consciousness. To the widespread general misery of hunger, is added a presentation of definite discomfort or pain referred to the epigastrium. To the widespread general misery of thirst, is added a presentation of definite discomfort or pain referred to the throat. To the general misery of breathlessness, is added a localised misery in the chest. To the general misery of nausea, is added a localised misery in the epigastrium. It is rare for the general misery to remain generalised and, as in the malaise of fever, to exhibit no local sign.

Not only may metabolism fail in divers ways, but it may fail in unequal degrees in different tissues, organs, or regions. An undue and intense metabolism may be localised in one place or another, in the shape of inflammation or other morbid change, and such changes will evoke a corresponding sensation of pain, which is very definitely presented; which is referred to a definite locality; which is definitely objectified.

Generally we may say, of the sensations of the subject-consciousness, as of the sensations of the object-consciousness, that, when they are presentations, they present variations of quality which correspond with variations in the mode of motion incident upon the nerve ending; variations of intensity which correspond with variations in the quantity of motion incident upon a given area; and variations of extensity corresponding with variations in the number of nerve endings upon which motion is incident.

THOUGHT

The process of thinking, when concerned with impressions belonging to the subject-consciousness, differs in no respect from that which is engaged upon impressions belonging to the object-consciousness. We localise a pain as here or there, in this or that part of the body by precisely the same process as we localise an object as here or there, in this or that part of the environment. When we distinguish the various qualities and magnitudes of sensations that are internally initiated; when we distinguish between rapid movement and slow movement, or between free movement and forcible movement of our limbs; we do so by the same process of comparison, with discernment of similarity and discrimination of difference, by which we distinguish between blue and red, between ships and buildings, between ambition and anger. From the sensations of bruises, cuts, burns, inflammations, and other disintegrative processes, we abstract the quality of pain, and we obtain by assimilation a general idea of concrete pains, by the same processes that we obtain a general idea of trees. In the cognitive region of the subject-consciousness there is nothing new to explain.

VOLITION

As motion is received by the supreme nerve regions, both through the special sense organs from the outside world, and directly from within the body itself, so motion is distributed from these regions, both through the musculature to the external world, and more directly to the other organs and tissues of the body. It is natural to seek for a phase of consciousness in the second case, answering to the volition, which in the first attends the distribution of motion.

As has before been stated, to speak of the process of Volition as a phase of consciousness is scarcely correct, if we limit the meaning of consciousness, as is sometimes done, to presentation. For Volition is essentially an activity of the subject. It belongs to the fourth or innermost self, and gets into consciousness only as a part of the third self. Thus all Volition in one sense pertains to the subject-consciousness, and falls to be considered here, but there are obvious

conveniences in dealing separately with the departments of volition that are here separated.

With respect to the issue of motion to the musculature, we have already found that this is attended by volition, when only the issue is from the supremest portion of the nervous system. When the issue is from any subordinate regions, volition is absent. We have seen, moreover, that Volition attends the spontaneous issue only of motion, and that in as far as the issue of motion is elicited and provoked by ingoing motion, in so far is Volition wanting. Only when motion is emitted from store by spontaneous overflow, does Volition come upon the scene. Thus, as we have already seen, very much of the work of the musculature is done without volition, and thus, too, volition attends that outpouring of motion from the highest nerve regions which does not reach the musculature at all, but is absorbed in producing modifications of nerve structure, with which modifications of mind correspond. The question now before us is whether there is anything that can properly be called volition, attending that distribution of motion that regulates the intra-bodily processes, like the volition that attends the distribution of motion to the musculature.

In connection with some of the bodily processes,—with the movements of those organs which maintain some degree of traffic with the external world, while largely subserving intra-corporal needs,—we find a distinct exertion of volition; and we find that the amount or degree of volition that is associated with the action of these organs varies a good deal in different cases; while, in the case of organs and processes whose work is wholly intra-corporal and invokes no traffic at all with the external world, no volition is associated with their action.

Coughing is an action that can be brought about solely by the spontaneity of the highest nerve regions. We can cough if we choose. It is usually started, however, reflexly, by an impression made upon the air passages; and then, in common with other reflexes, is destitute of volition. The reflex cough can be reinforced by an added element of spontaneous motion, liberated *ad hoc* from the highest nerve regions, and this added element is accompanied by volition. Coughing may therefore be wholly reflex, wholly spontaneous, or compounded of reflexion and spontaneity in various proportions; and while the reflex element is destitute of all accom-

paniment of volition, this accompaniment is present in degree proportionate to the amount of the spontaneous element that enters into the action. In proportion as the reflex element predominates, in that proportion the act is independent of volition, not only in its initiation, but in its control or inhibition also. Over the evacuation of the rectum and bladder, the voluntary control is less complete. These movements cannot be initiated centrally. They must first be elicited by an impression from the periphery. Neither the rectum nor the bladder can be evacuated solely at will — solely by the spontaneous liberation of motion from the highest nerve regions. The activity of these regions must first be solicited by an impression flowing upward from the distended viscus. When this impression is received, a reflex is set up, tending to the relaxation of the sphincter, and the contraction and evacuation of the organ. If the impression be very powerful, the reflex is correspondingly powerful, and the viscus is evacuated without the spontaneous addition of stored motion; without any concurrence of volition. If the impression sent upward is but feeble, a large amount of motion must be added in order to produce evacuation; and the concurrence of volition is correspondingly conspicuous. The function of these viscera stands midway between coughing on the one hand and vomiting on the other. Vomiting is almost a pure reflex. Provided the impression is sufficiently strong, the action must take place; and if the impression be not sufficiently strong, there is no mechanism for reinforcing the reflex by added motion, and vomiting cannot be effected by any exercise of will. If we want to induce vomiting, it is no use trying to vomit. We must get an increased reflex by augmenting the stimulus—by taking an emetic, or tickling the back of the throat.

Lastly, there is the outpouring of motion from the highest regions of the nervous system to the body at large, which co-ordinates the whole of the bodily processes, harmonises them with each other, and controls, in the last resort, the functions of the viscera, the blood supply, and the general process of metabolism throughout the body. Whatever issue of motion takes place to this distribution, has normally no accompaniment of volition. But in addition to considerations already adduced, it appears, from hypnotic phenomena, as if the metabolic process could be modified in special directions by means of currents emitted from the central focus of nervous activity. In this field, knowledge can scarcely be said to exist. We are in a region

of barren speculation, and if any speculation is less barren than the rest, it would be that whatever influence is exerted by the highest nerve regions upon metabolism, is never spontaneous. It is never due to the autogenetic activity of these regions, but is always reflex or elicited action, and as such is unattended by volition. If the experiences of hypnotism, in so far as they can be accepted,—and how far they can be accepted remains a matter of the greatest doubt, —if these experiences seem to indicate that, in certain cases, this influence is not reflex, but is imposed by a quasi-spontaneous outflow of motion, which takes place by "suggestion," then there are certain occurrences, within the region of the normal, which are in some respects parallel, and which may profitably be examined here. I refer to the occurrence of bodily change in emotion.

As has already been stated, the first occurrence in the genesis of emotion is always a thought. It may be a percept, a memory, or other concept, but until a definite thought has been established, there is no emotion; and the character of the emotion is determined by the character of the thought. Immediately upon the establishment of the thought, and undoubtedly consequent upon it, ensues a group of widespread bodily changes. The hair horripilates, the face blanches, the skin sweats, the legs tremble, the pupil dilates, the heart's action diminishes, the saliva is arrested, the urine is increased; or the face flushes, the body is braced, the heart's action is increased, the eyes glisten, and the pupil contracts, according as the thought is the basis of fear or of anger. In these occurrences, as in the alleged occurrences of hypnosis, there is a definite sequence, nay more, we are compelled to admit, a definite consequence, of bodily changes upon the formation of a thought; and in both cases there is a very marked and conspicuous absence of anything in the nature of volition interposed between the one and the other. In respect of the instantaneousness, the invariability, the inevitability of the response, and of its complete independence of volition, the consequence of the bodily change upon the thought has the characters of a true reflex —of the passage of motion through a determinate mechanism. Although the whole of the emotion is certainly not, as is maintained by a recent writer, dependent upon the bodily change, yet it is probable that a large part, if not the whole, of the pleasure or pain that enters into the emotion, is the mental reflexion of the bodily change; that is to say, this bodily change, centrally initiated, sets up

ingoing currents by which its general direction, as accessory or detrimental to the general welfare, is reported to headquarters, and here the corresponding state of pleasure or pain is then established. A corroboration of this view is to be found in the fact, that while the bodily reflex is instantaneous upon the establishment of the thought, the full emotional colouring of pleasure or pain is not instantaneous, but takes an appreciable time to establish, and grows in intensity after the first initiation. The first moments of fear are by no means the worst; nor is the maximum of joy reached immediately upon the receipt of good tidings. In both cases an appreciable time must elapse before the full degree of pleasure or pain is experienced, and this time is occupied in the gradual reception of impressions of the cœnæsthesis.

THE SUBJECTIVE NATURE OF MENTAL PROCESSES

In dealing with Volition as a phase or aspect of the object-consciousness, as a part of that which is presented to the inner self, we have taken up a position which is not legitimate, except in so far as by object-consciousness is understood the object of contemplation described in our fourth abstraction or sublimation of the self. Volition does not belong to that object-consciousness which is defined in the third description of Self, although Volitions do so belong. That is to say, the process of volition is an activity of the subjectissimus or innermost self. In its actual occurrence it is identical with the innermost self; it is a phase or attitude of this self. In the putting forth of activity, in the process "I will," there is no object-consciousness. It is pure self. But then there is no such experience as "I will" pure and simple. The only actual experience is "I will this," and the "this" that I will belongs to the true object-consciousness, while the activity itself belongs to the subject. There is no activity except as exerted upon something or in some direction, and in some degree; and while the activity is subjective, the object on which it is exerted, the direction and the degree, all belong to the object-consciousness proper. Volition once exerted, the activity, together with its object, are projected into the outer-consciousness and are there contemplated by the subject, not as volition, but as a volition; and in this aspect, and in this aspect alone, volition belongs to the object-consciousness. The process itself is pure subject.

But it is evident that what is true of the process of Volition is true of all other mental processes. While Thoughts are objects of contemplation to the subject, the process of Thinking is an activity of the subject. While memories are objects of contemplation to the subject, the process of remembering is an activity of the subject. And even of Sensation, it is true in a similar sense, that while Sensations are objects of contemplation by the subject, yet as they are received, in the moment of their reception, they are rather modifications of the subject than objects of contemplation by it. With respect to Pleasure and Pain, their deliberate and artificial objectification is even more apparent than that of the other phases of mind. They are, in their occurrence, pure affections of the subject, and it is only by a fiction that we can bring them out into the field of object-consciousness for examination.

Thus the self of the second degree of abstraction, the mind, or soul, or spirit, consists of a subject, capable of various modes of activity, and of various products of its activity. It differs from other selves in two ways, first, in the degree of activity in the various modes of which it is capable, and second, in the collection of products which it retains; differences that are often expressed as differences of innate power on the one hand and of experience on the other. As every individual has his own innermost self, his own subjectissimus, which can exert activity to certain extents in certain directions; so he has also his store of products of these activities; and the extent, in each direction, to which his activity reaches, combined with the store of products, together make up an individual, different in both respects from every other individual; and this specific character of activity and experience constitutes to each his individuality.

DISORDER OF THE SUBJECT-CONSCIOUSNESS

From what has been said it is evident that this field may be regarded as a very large one. It may be regarded as including all disorders of the processes of mind, the correlative disorders of the object-consciousness being limited to errors in the products. It would be inconvenient, however, to extend the range of the subject-consciousness to its possible maximum, and all that will be dealt with here under this title are the modifications of the self with which psychologists are acquainted.

The first of these, the most frequent and the most general, is that general modification of the affection of the subject-consciousness which we express by saying "I am happy," "I am miserable." It has been said that all pleasure and pain belong properly to the subject-consciousness, but this is eminently and conspicuously the case with that pleasure and pain with which we are now dealing, which has no localisation, no limitation, no objectivity, but pervades and suffuses the whole being. Affection of this kind either has or has not its justification in the circumstances of the individual, and his relations with his surroundings. If these relations are such that he is gaining ground; that he is winning in the battle of life; that, in that secular conflict between the organism and the environment of which we have elsewhere spoken, he is temporarily victorious; in such a case his whole self is suffused with pleasurable affection; he is happy, and his happiness is the outcome of, and is justified by, his circumstances. On the other hand, if he is losing; if he is falling back; if he is becoming overpowered in the strife; then, correspondingly, he is pervaded by a feeling of misery, whose intensity measures that of his adversity.

But there is another occasion of origin for this affection of the subject. The modification may arise, the happiness or misery may be felt, in correspondence, not with any gain or loss of the welfare of the individual in his struggle with circumstances, but in correspondence with some internal change that takes place in the body itself. The relations with circumstances may be prosperous and thriving, but yet the self is sunk in gloom. The relations with circumstances may be stationary, or receding, or even disastrous, to the welfare, and yet there may exist a state of elated happiness quite out of harmony with these relations, and determined by some mode of the internal bodily processes.

What is the nature of the bodily change that thus determines the affective colouring of the whole self? This is a matter of pure speculation, but there are indications pointing to the direction from which a solution may some day be obtained. That is to say, while there are many occasions of misery and happiness in which there are no more indications of justifying bodily change than there are of justifying relations with the external world, yet there are some occasions on which a definite bodily state or change can be identified as the condition of the exaltation or depression. We find, in the

first place, that the feeling of happiness is usually associated, not only with a feeling of enhanced capability, but with actual increase of activity in conduct. Boisterousness in conduct goes with hilarity in mind; energy of movement with high spirits; and, on the other hand, with misery there goes not only the sense of diminished capability, but an actual diminution in the amount of movement. People who are miserable are sluggish, lethargic, and unenergetic. This pair of concomitances points to the supposition that when there is much free motion alive and circulating in the nervous system, the level of happiness and efficiency is raised; and that misery and inefficiency are definitely associated with a deficiency, or low level of pressure, in the nervous energy; and, on the whole, the facts support this view, although there are some which tend the contrary way. In the later stages of general paralysis, for example, when motor efficiency is reduced to a very low ebb; when the patient is bed-ridden from a paralysis of central origin, and incapable of even feeding himself; he often retains to the full his hilarity and irrepressible self-confidence. In the most extreme depression, on the other hand, the patient, so far from remaining sunk in lethargy, is often active in the extreme; pacing up and down with rapid gait, wringing his hands, and throwing his arms about, mourning and lamenting with an exceeding bitter cry. In view of these morbid phenomena, the hypothesis that feeling is determined by the amount of free motion in the nervous system cannot be accepted without qualification.

The next hypothesis which finds support from experience is that modifications of the tone of the subject-consciousness correspond with modifications of the incoming impressions, derived from the molecular movements of metabolism around the peripheral extremities of the somatic nerves; a joyous tone corresponding with vigorous and normal metabolism, and a tone of depression corresponding with morbid alterations of metabolism. For this hypothesis also there is much to be said. The misery that attends various interferences with metabolism under circumstances within the normal, the wretchedness of hunger and thirst, have already been alluded to; and allied to them are the malaise of fever, and the wretchedness of other bodily illnesses. With regard to this class of influences there is an obvious fallacy possible, for we know not how far the modification of consciousness may be due to the altered nature of the arriving impressions, or how far it may not be due to the direct modification of the nutrition

and action of the neurons themselves, under the alteration of pabulum supplied to them by the blood. There is very clear evidence that the feelings of well- and ill-being may be modified by both of these means. In the extreme misery of nausea, there is no reason to suppose that there is any disturbance of the nutrition of the neurons. The whole of the misery appears to arise from incoming impressions, and the proof of this is in the alteration of feeling that ensues immediately after the act of vomiting has removed the source of the painful impressions. On the other hand, the joyous elation that follows the imbibition of alcohol, appears, not when the alcohol is introduced into the stomach and stimulates the nerve ends, but when it has been absorbed into the blood and presented to the neurons as pabulum for their use. So that it is evident that the feeling of well-being is affected in both ways,—both by incoming impressions belonging to the cœnæsthesis, and by the nature of the pabulum supplied to the neurons.

There still remains the question whether these two latter modes may not be resolvable into species of the mode first considered,—whether, that is to say, the feeling of well-being is not enhanced whenever the intra-neural activity is increased, be it by the increased stimulus of arriving impressions, or by increased stimulus of chemical action directly applied. We have seen reason to doubt whether there is in fact a direct correspondence between the neural activity and the feeling of well-being, and it seems certain that the correspondence is not a simple one — that there is some disturbing factor,—that if there be a correspondence it is a correspondence *secundum quid.*

As at present advised, there would appear to be four sets of conditions under which the pleasure and pain of the subject-consciousness undergo modification, viz.: (1) When we have knowledge of increase or decrease of efficiency, increase or decrease of success, in the battle of life. (2) In certain cases of increase or decrease in the amount of free motion, or in the tension of the energy circulating in the neurons. (3) With the alteration, either in quality or quantity, of the impressions of the cœnæsthesis. (4) When the nutrition or action of the neurons is directly altered by the incidence upon, or absorption into, them of chemical substances mingled with the blood. Of these four modes it is probable that the last is of the greatest pathological importance, and that the majority of the morbid alterations

of the feeling of well-being, whether in an upward or downward direction, are due to this cause.

In such modifications of the self as we have considered, the self maintains its identity, although its affective colouring is altered. I may be miserable, or I may be happy, but throughout all such changes of feeling I am the same self. The I who am now writhing in colic, or prostrated with nausea, am the same I that yesterday was elated and capable. My feeling is altered, but my identity is unchanged. There is another class of alterations, however, in which the modification of the self is so profound that it can no longer be regarded, that in some cases it no longer regards itself, as the same self. It has a new set of capabilities, different from the old; it has an altered set of registered experiences, different from the old.

In everyone some such alteration of the self takes place as age advances. The adolescent, full of love and romance, eager for adventure and longing for fame, is a very different being from the child of a few years before, whose chief desires were to fill its belly and escape from its lessons. A few years later, the disillusioned paterfamilias, worn with family cares, is again a different being from either; and still the character changes with the increase of age. But still the identity of self has been continuous. There has been no break in the serial progress. Although the middle-aged man looks back upon his boyish self as a different being, yet not only is there no gap in the series, no time at which the one individual ceased to be and the other began, but the boy's acquirements and memories, so far as they are retained by the man, are recognised as his own acquirements. The boy's experiences were his own, and his identity, however much he may have gradually changed, has been preserved in continuity. Even the gaps of sleep make no difference to the continuance. The thread of life is resumed in the morning where it was relinquished the night before. Whatever of new modes of activity, of new capabilities, appear within the self; whatever of new experiences, of new acquirements, are accumulated in the object-consciousness; are assimilated into, and identified with, the same enduring self.

But this continuity of identity is not always preserved. In some cases it is partly, in some it is completely, broken. A man experiences in his life some great and stunning crisis, and out of this crisis he emerges with an altered individuality. His character is different.

His customary modes of activity are altered. His old inner self has disappeared and been replaced by a new. Of this transformation many cases are on record, cases which differ in the following material respects, that is to say: They differ in the permanence of the change. In some, and these are rare, the change is made once for all, and there is no return to the previous self. In others, the new self is but temporary, and, after a longer or shorter time, the old self is reinstated, to be again replaced by the new after an interval; and this alternation of selves may go on throughout a long life. The second respect in which the cases differ is in the degree of persistence of the acquirements, or the specific object-consciousness. It may be that when the active self, or subjectissimus, changes, the new self yet retains all that the old had acquired by experience; and that when the old self is restored, the experiences of the new self are added to and incorporated with its store; so that, with a changing subject, there is a continuous object-consciousness. Or it may be that when the subject undergoes its revolution, the greater part of the acquirements of the old self are lost with the old self, and the new self is an ignorant, uneducated, inexperienced individual. The old self may have been learned and literary; the new may be unable to claim his clergy. In this case both subject- and object-consciousness are started *de novo*. In other cases, the new self carries all the acquirements of the old, but when the old is reinstated, it retains none of the acquirements of the new. The remembrance of the new self is a continuum stretching back to the dawn of consciousness, but so long as the old self is the existing individual, its past life is chequered by blank spaces of which no recollection remains, these spaces being the times of existence of the new self. Or this state of things may be reversed, and the old self alone may carry the double object-consciousness, the new carrying only the experiences peculiar to itself; or finally, each separate subject may carry its own acquirements only, and then there are two completely separate selves alternating within the same body, and leading completely separate lives. It is evident that we have here some similarity to the occurrences of *petit mal*, in which the ordinary self knows nothing of the experiences of the self of post-epileptic automatism. It is commonly assumed that in the periods of automatism there is no consciousness and no self at all; but it is difficult to believe that there is no consciousness at all in the cases of very prolonged and elaborate automatism, in which the patients "lose themselves" for hours or even

days; make long journeys; buy and sell; and perform other elaborate acts. And if there be consciousness, then such cases are cases of double personality; and we have in them a link which connects these rare and strange and obscure phenomena with others that are in the range of our everyday experience.

The third respect in which cases of double personality differ conspicuously from one another, is in the direction of the moral change, if any, that takes place with the change of personality. In some cases the new self is much the same in this respect as the old; but in many cases there is a conspicuous alteration of moral proclivities, as well as of intellectual capacity. The new self may be stupid and ignorant, and much below the intellectual standard of the old,—and in such cases, again, we recognise an approximation to the condition of *petit mal*;—or the new self may be intellectually the superior of the old. And similarly, the old self may be punctual and honest, may be confirmed in habits of temperance, soberness, and chastity; while the new may be a rake and a thief. Or the reverse change may take place, and the thief become honest, the drunkard sober, and the rake chaste. When the change is in the latter direction, and involves amelioration of character, the case is one of "conversion," in the theological sense; the most conspicuous instance being that of St. Paul, who, as he himself expresses it, put off the old man and put on the new.

It would be a very barren task to speculate upon the bodily changes that underlie these transformations of self. They have been very confidently stated to depend upon the dualism of the brain, one hemisphere alone being active during one state, and the other during the other; but an hypothesis of so wild a character, and so utterly unsupported by evidence, does not merit serious discussion. All that we can say is that we do not know.

In addition to the general changes in the feeling of well-being, and to the changes of personal identity that we have considered, there are certain other morbid alterations of the subject that occur in insanity and allied states. The person describes himself as "altered," as feeling "not the same," as "unnatural"; expressions which carry to us no meaning but this: that the alteration of which they are conscious is an alteration of the subject, and is not in the object-consciousness.

In insanity, while the most conspicuous change is usually in the

object-consciousness, the subject is invariably altered in some degree; and while the alterations in object-consciousness, the delusions, hallucinations, etc., are what attract our attention and determine our judgement in cases of insanity, it is manifest upon consideration that the real underlying fault, the essence, of insanity is in the Subject, of which the object-consciousness is, after all, only a product. If the product is faulty, it must be because the process of producing has been wrongly conducted; and if, in the object-consciousness, there are beliefs inconsistent with experience, it can only be because the process by which beliefs are formed and maintained is disordered. Rightly considered, insanity does not consist in delusion, any more than disorder of a machine consists in the faulty quality of the product that it turns out. Insanity is in the faulty process; in the disordered activity; in the wrong mode of working; and all activity pertains, as we have seen, to the Subject. Hence the right view of insanity is that it is disorder of the subject, manifested in disorder of the object-consciousness. Insanity does not consist in delusion, but in the disorder of the thinking process which results in delusion. It does not consist in the absurd or ruinous thing chosen, but in the disorder of the process of choosing. It does not consist in the illusion or hallucination, but in the disorder of the process of perceiving which renders illusion or hallucination possible. It is this subjective nature of insanity that constitutes the extreme difficulty of investigating it; for while we can argue from object-consciousness, as we know it in ourselves, to the object-consciousness of others, the subject itself is not known. It is, in every experience, the factor which knows, not which is known; and, as soon as it is projected into the object-consciousness for observation, it ceases to be the subject.

There are two senses in which a mental occurrence may be said to be explained. It is explained when we can trace its mental antecedents; and it is explained when we can describe its bodily conditions. A fallacious argument is explained when we can lay our finger upon the precise step at which two terms were confused, or at which similarity was discerned while difference was not discriminated. A discord in sound is explained when we can show that the wave-lengths of the aerial undulations, having no precise ratio to one another, stimulated the nerve endings in such a manner as to cause disintegration out of proportion to the magnitude of the impression received. In neither sense can we explain the occurrences of insanity. Its mental ante-

cedents we cannot trace. Of its bodily accompaniment we are entirely ignorant. It is easy to identify the products of the disordered subjective activity,—to identify the delusion, the hallucination,—and to describe precisely in what the departure from the normal consists; but if we go behind the product, and try to realise the nature of the disorder of process upon which the faulty product depends, we are brought up against an impassable barrier. When a person believes that he possesses millions upon millions, with every luxury and power that wealth can buy, at the same time that he is actually a pauper in a workhouse, with all the sordid surroundings of his position, we are quite unable to picture to ourselves the nature of the process by which his delusion is reached and maintained. We can form some dim and approximate idea that, as a current of motion passes inward along the nerves and reaches some destination—breaks upon some shore,—a sensation arises in the mind; but what physical state or process underlies this "I myself," who feel, act, will, and think, I can form not even an approximate concept; much less can I conceive a modification or disorder of such a state or process. That insanity is a disorder of the process of adaptation of the self to its circumstances seems to me as true now as it did when I first put it forward ten years ago; and every phase and factor of insanity, whether disorder of thought, feeling, perception, emotion, volition, or conduct, is expressible in terms of this formula; but the formula is a descriptive definition, not an explanation; and while it correctly indicates of what process insanity is the disorder, it does not help us to a knowledge of the nature of the process, or of the way in which it is effected.

Be this what it may, we have to recognise that in insanity there are not only those disorders of the object-consciousness—those delusions, doubts, obsessions, and so forth, which are described in the text books, —not only is there often an alteration in the feeling of well-being—a melancholy or an elation—which is sometimes recognised to belong to the subject; but there is, in addition, a more profound and intimate change in the subject itself; a change in the mode of activity; a change in the capacities or possibilities of acting; a change in the direction of action; a change, in short, of the very self; which renders the insane man a different person from his sane self. This is the meaning of that "altered disposition," that "deterioration of character" which is so often spoken of as a frequent sign of insanity. Of all the pitiful statements that are made by the friends of insane persons, none

is more pitiful than the frequent exclamation, "Oh, doctor, he used to be so different! You would never believe it was the same man." The same man he is, but not the same person. Within that same body the personality is changed; and it is a new self that looks out from those familiar eyes. The curses and revilings that come from those loved lips do not proceed from the old self, the self endeared by kindness, sympathy, and affection, but from a new self, which has, perhaps, not even its object-consciousness in common with the old. Thus insanity differs by its universality from all other infirmities to which man is subject. It is a disorder neither of the body alone, nor of the mind alone, but of both. It is a disorder, neither of the Subject alone, nor of the object-consciousness alone, but of both. It is a disorder, not of the affection alone of the subject, not of the sense of well-being alone, but of the degrees and modes of activity as well. It is a universal disorder. In insanity, not only are mental processes wrongly conducted; not only is the sense of well-being unadjusted to the circumstances; not only are the products of mental activity erroneous; but the bodily processes also are modified, often profoundly modified. We can observe the skin, macerated in its own sweat, desquamating and stinking; we can observe the fingers and toes in one large bleb from chilblains; we can observe the distorted nails, the harsh and staring hair, the pigmentation and the changes of complexion that so often occur in insanity; but we cannot observe the internal changes, the alteration of metabolism, the subtle changes of visceral function which go along with the changes that we do see. All experience leads us to infer that such changes there are, and that with the *mens insana* is invariably conjoined a *corpus insanum.*

INDEX

Abraham, Dr., 476
Abstraction, 44, 51, 56; errors of, 61; degrees of, 45
Abstract thoughts, 46
Accident, fallacy of the, 107
Accumulation, instinct of, 357
Æsthetic value of Pleasure and Pain, 435
Affection, 423; and attention, 458; and delusion, 274; and sensation, 441, 475; and thought, 444; and will, 464
Age and memory, 385; and self-consciousness, 507
Allen, Grant, 424, 436, 439
Ambiguous middle, 103, 105
Amphibology, 103
Analogical inference, 119
Analogy, 41, 56, 114; faults of, 119
Antipodes, 203
Aphasia, 422
Apperception, 244, 383, 388, 400, 417
Apprehension, 32
Archaic instinct, 332
Aristotle, 90, 99
Association, by contiguity, 406; by similarity, 405
Attention, 283; and emotion, 459; and memory, 387; and remembrance, 403, 407; and will, 314; disorder of, 345; determinants of, 287, 293; in general paralysis, 351; in mania, 350; in perception, 64, 286; reflex, 284, 458, 486; unity of, 348; voluntary, 284, 459, 486
Authority, 230, 250; and belief, 261
Automatism, 320, 508
Aversion, 6
Axiomatic reasoning, 75

Babbage, 350
Bacon, 120, 242, 243
Bain, 408, 424, 461
Barbara, 96, 97, 98
Baroko, 97, 99
Belief, 56, 57, 374; and authority, 230, 250, 261; and conduct, 253; and desire, 235; and will, 235; as memory, 410; as motive, 470; categories of, 168, 264; destruction of, 256, 261; degree of, 173; errors of, 248; pain of attacks upon, 449; pains of destruction of, 447, 477
Believability, 161
Bias, 219
Bishops as witnesses, 216
Blows on the head and memory, 414
Body and mind, 2, 491
Bramantip, 98, 99, 100
Buridan, 364
Burke, 219

Camenes, 99
Camestres, 97, 99
Canons of the syllogism, 92
Categories of belief, 168, 264
Celarent, 96, 97
Cerare, 86
Cerebration, unconscious, 396
Certain probabilities, 187
Certainty, 56, 152, 165, 182, 200, 264, 374; negative, 168
Chances, doctrine of, 172
Character, 341

Chess and Apperception, 246
Choice, 304, 312
Classification, 50; of emotions, 454
Coleridge, 389
Columbus, 213
Combative instinct, 358
Complexity of thought, 39
Composition, fallacy of, 103
Conceivability, 161, 264
Conduct and Belief, 253, 260
Conflict of pleasure and pain, 433
Conjecture, 262; and delusion, 262
Consciousness, 1, 4, 493; as presentation, 493, 498; as a function of motion, 4; divisions of, 4
Conspiracy, 218
Constancy in experience, 80, 156, 181
Constantine, 216
Copernicus, 71
Coughing, 499
Counting mania, 369
Courtship, 437
Credibility, 56, 210, 264; a function of experience, 210, 212; extrinsic, 216; intrinsic, 216
Credit of witnesses, 220
Curfew, 446

Darapti, 97, 98
Darii, 96, 98
Darius, 232
Darwin, 151
Datisi, 98
Deduction, 142, 149
Defect of memory, 419
Defect of thought, 57
Deliberation, 314, 361
Deluded states, 274
Delusion, 206, 374; association of, with pleasure and pain, 478; and conjecture, 263; classification of, 267, 274; growth of, 268, 271, 478; measurement of, 268, 273; mode of formation of, 132, 481; nature of, 265, 273, 481; nervous basis of, 133, 273; of exaltation, 278, 488; of persecution, 279, 485
Dementia, 66, 346, 483
De Morgan, 107, 110, 173
Depression, mental, 353
Descartes, 93
Desire, 6, 298, 373; and will, 235, 298, 320, 326; undirected, 330
Determination, 299, 310, 319; disorders of instinctive, 355; of acquired, 361, 418
Determined acts, 307
Diamond, liquid, 159, 265
Dictum de omni et nullo, 84
Dimaris, 99
Disamis, 98, 99
Division, fallacy of, 103
Doctrine, 149; of chances, 172
Doubt, 161, 264, 267, 272
Dreams, memory of, 387

Effort, 294, 334; disorder of, 352
Elasticity, 376
Electricity and delusion, 275
Emotion and memory, 387; classification of, 454; disorder of, 472, 477; nature of, 450, 501
Emotional person, 484
Empiricism, 198
Endurance of memories, 385
Epistemology, 169
Equality, 38, 50
Equivocation, fallacy of, 103
Error of Belief, 248; *post rem*, 254
Essence of the Schoolmen, 243
Euler, 85
Evil, Origin of, 424
Exaltation, bodily change in, 505
Excluded middle, 200
Expectation, 190; and authority, 230; and temperament, 194; of credibility of witness, 229
Experience, 6; and belief, 272; and credibility, 210, 272; constancy in, 156; indirect or vicarious, 211, 215; uniformity in, 159

Fact, 165

Faith, 230
Fallacies, 101
Felapton, 98, 99
Ferio, 96
Fermat, 143
Fesapo, 98, 99
Festino, 97
Figures of the syllogism, 95
Folie du doute, 272
Forgetfulness, 390
Forms of thought, 40
Four terms, Fallacy of, 103
Free will, 312
Fresison, 99

Galero, 96, 98
Galono, 96
Genius, 243
Generalisation, 47, 51; faults of, 61
General paralysis, Attention in, 351; effort in, 352
Good, nature of, 464
Government, Credit of, 233
Gravitation, 205

Hale, Sir M., 206
Hallucination, 69
Hamilton, Sir W., 91, 96, 395
Hartley, 405
Hastings, Warren, 219
Hebrews, Display of emotion by, 484
Helmholtz, 457
Hesitation, 314, 361; disorders of, 364
Homicidal impulse, 371
Honesty, 356
Hunger, 497
Hypnotism, 500
Hypothesis, 149

Idiocy, 66
Ignoratio elenchi, 108, 463
Illicit major, 106; minor, 105
Illusion, 68
Imperception, 64, 123
Impulsive insanity, 372
Inconceivability, 161, 170, 201, 207, 264
Incredibility, 163, 264
India, 211
Individual, the, 490
Induction, 141
Inequality, 37
Inference, analogical, 119; and memory, 191; immediate, 56, 89, 149; faults of, 130; in perception, 64, 71; mediate, 44, 134; proportional, 120
Insanity, nature of, 510
Instinct, 302, 328; archaic, 332; disorders of, 335; migratory, 302, 311; nidificatory, 302, 311; reversal of, 358; perversion of, 360
Intelligence, 20, 23; as adjustment to circumstances, 27
Irish, display of emotion by, 484
Irrecoverable delusion, 269

James, William, 451, 462
Jenner, 238
Jevons, 33, 100, 102
Johnson, Dr., 263, 370, 385
Judgement, 30, 40; legal, example of, 62
Jus Civile, 216
Justice, 356

Keynes, 86
Keynote, 457
Knowledge, 211

Lamb, Charles, 263
Law of Motion, 401
Legal judgments, 52, 62
Life, teleological aspect of, 6
Likelihood, 166, 188, 264
Likeness, 36
Long run, the, 187
Loss of control, 420

Macaulay, 117, 120, 385
Mackintosh, Sir Jas., 263
Magellan, 213

Majority, relation of, 39
Mania, delirious, attention in, 350; ravings of, 421
Many questions, fallacy of, 114
Maternal affection, 355
Mathematical reasoning, 52
Mechanisms, 23, 300, 308, 358, 392; disorders of acquired, 361, 418; of instinctive, 355; parasitic, 273, 338, 360, 367, 369
Mediate inference, 44, 134
Melancholia, 279, 353, 487, 496, 504; bodily change in, 504
Memory, 5, 32, 375; active, 380, 392; and affection, 471; and attention, 387, 407; and belief, 387; conscious, 380, 390, 394; dynamical, 375, 391; endurance of, 385; faithfulness of, 383; faults of, 413; loss of, 414; in old age, 420; in perception, 64; structure, 375, 382, 414
Mental processes, subjective nature of, 502
Metabolism, 496
Metaphor, 116
Mill, J. S., 67, 70, 74, 76, 118, 125, 169, 199, 254, 261
Mind and body, 2, 491
Minority, relation of, 39
Misery, 496
Modes of sensation, 8; of thinking, 41
Modesty, 356
Moon, and change of weather, 256
More, Sir Thos., 263
Morgan, De, 107, 110, 173
Motive, 468

Napoleon Buonaparte, 370, 449
Natural selection, 5, 305, 449
Negative premisses, 93, 106
Nervous system, constitution of, 2, 21; functions of, 2; and self, 489
Newton, 150, 242, 305, 447
Nightmare, 353
Non causa pro causâ, 113
Non sequitur, 112
Noumena, 208

Object-consciousness, 4, 493; and emotion, 452; and pain, 440
Observation, 53; errors of, 70
Obsession, 368, 421
Old age, mania of, 484; memory in, 420
Originality, 238
Origin of Evil, 427

Pain, 6, 305; and delusion, 274, 423
Panic, 219
Parasitic mechanism, 273, 338, 360, 367, 369
Patriotism, 435
Perception, 53, 125, 148; complexity of, 64; disorder of, 64
Personality, 488; alteration of in insanity, 512; disorder of, 276, 348, 508
Perversion of instinct, 359
Petitio principii, 74, 83, 88, 110, 122
Pilate, question of, 201
Pleading, an instance of syncrisis, 52
Pleasure, 6, 305; and delusion, 274, 423; of admiration, 455; of imagination, 455
Pleasure and pain, conflict of, 433; faults of, 474; grades of, 435; memory of, 471
Poison, 385
Possession, diabolical, 368
Possibility, 210
Practice, effect of, 26, 391
Predatory instinct, 358
Principium contradictionis, 154, 200
Probable certainty, 187
Probability, 129, 170, 188, 196; and likelihood, 188, 196
Probability of truth of evidence, 174, 227
Proof, 140
Proportional inference, 42, 120; faults of, 123
Pythagoreans, 243

Rationalism, 198
Reason, 140, 143

Reasoning, axiomatic, 75; deductive, 142; from particular to particular, 142; inductive, 141; proportional, 42, 120
Recognition, 53
Recoverability of delusion, 268
Recreative activity, 331
Reflex attention, 284; will, 304; acts, 282, 499
Remembrance, 400; and attention, 403; excess of, 419
Remigius, 243
Reproductive instinct, 6, 355; and self-sacrifice, 435
Reversal of instinct, 358
Rhythm, 456
Rousseau, 243

Scepticism, 251
Schoolmen, 242, 243
Scientia *post rem*, 254
Self, 488, 503; alteration of, abnormal, 508; with age, 507
Self-consciousness, 1, 4, 488; disorder of, 276, 282, 348, 503; and delusion, 276
Self-sacrifice, 435
Sensation, 4; and affection, 446, 472, 475; and emotion, 19; defect of, 14; correspondence of, with reception of motion, 7; disorder of, 13; delusion of, 276; elements of, 8; modes of, 8; of subject-consciousness, 493, 495; pure, 494
Sequence, 39
Seth, Professor, 85
Shakespeare, 305, 342
Shame, 436
Sheridan, 141
Sidgwick, Professor, 169
Simple apprehension, 32
Simultaneity, 39
Spencer, Herbert, 46, 169, 199, 492
Strength of Will, 299, 424
Struggle for life, 5
Struldbrugs, 147
Structural memory, 375, 382, 414
Stupor, 346
Subject-consciousness, 1, 4, 448, 493; affection and, 440; and emotion, 452; delusion of, 276; disorder of, 503
Subliminal consciousness, 396
Suicidal desire, 358
Sutherland, Alexander, 451
Syllogism, 75; figures of, 95; moods of, 95
Syncrisis, 44, 45

Talent, 243
Taste, biologic importance of, 441
Temperament and expectation, 194
Temperature, 442
Testimony, concurrent, 218; credibility of, 210; inadequacy of from ambiguity of words, 224; from misuse of words, 223; from want of words, 222
Thinking, 20, 40; and willing, 312
Thought, 4, 20; and subject-consciousness, 498; and will, 312, 316; in emotion, 451; relation between mental states, 30, 35, 40
Traduction, 142
Truth, 197; test of, 207
Truths, 168, 264
Tuke, Dr. Hack, 268, 369
Twisting couple, 375

Unbelievability, 161
Unconscious cerebration, 396
Undistributed middle, 104
Unlikeness, 37

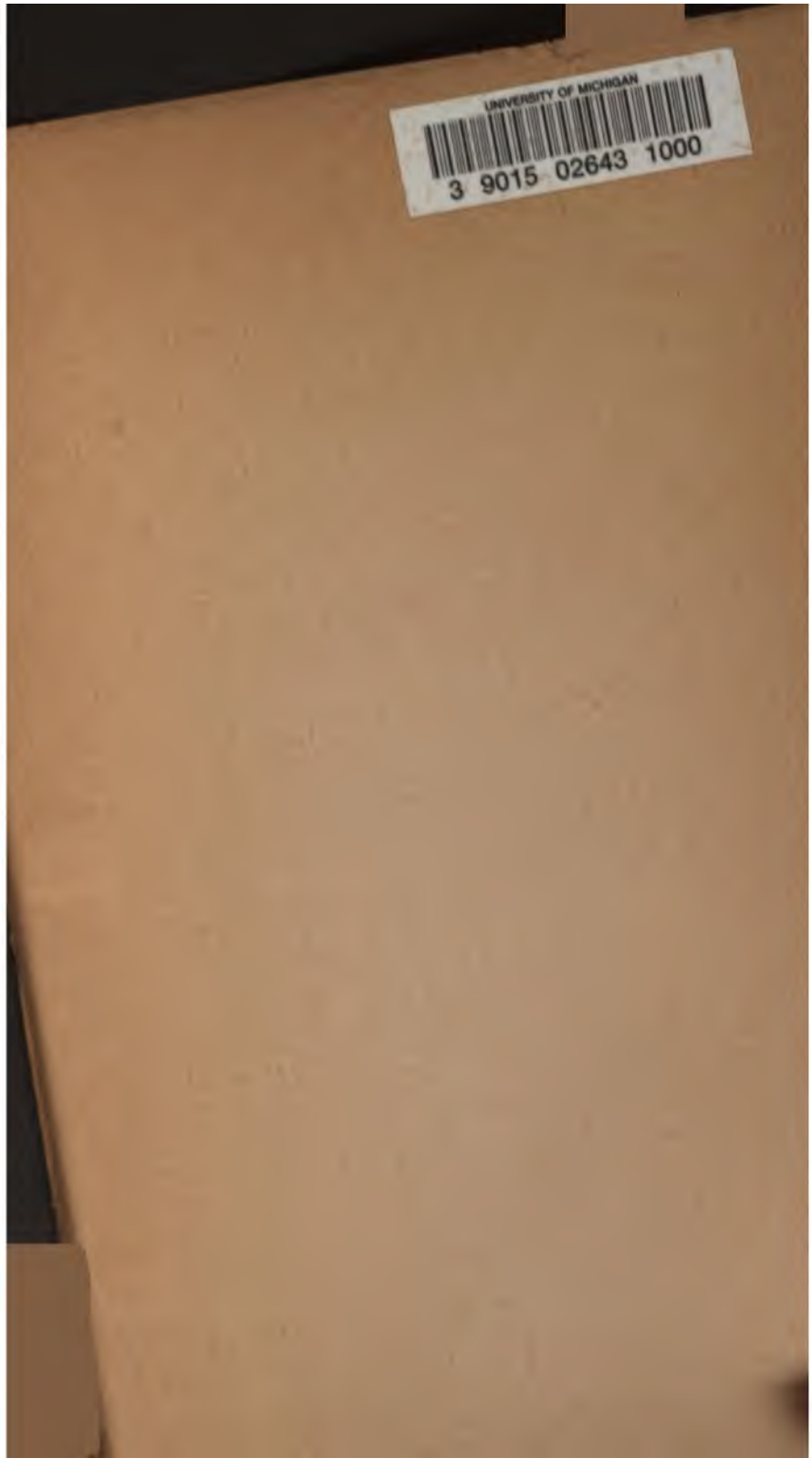
Vacillation, 365
Venn, Mr., 76, 305
Verbigeration, 421
Village pound, 447
Viscera, sensations from, 496; and volition, 499
Vividness of experience, influence of, on expectation, 192; on memory, 384

Volition, 282; and affection, 466; and subject-consciousness, 498; faults of, 344

Wadman, Mrs., 436
Weather, and changes of the moon, 256
Weber's law, 10, 179
Weismann, 112
Whately, 32, 93
Will, 4; and affe
235; and de
thought, 316;
300, 321; spo

Volition, 282; and affection, 466; and subject-consciousness, 498; faults of, 344

Wadman, Mrs., 436
Weather, and changes of the moon, 256
Weber's law, 10, 179
Weismann, 112
Whately, 32, 93
Will, 4; and affection, 464; and belief, 235; and desire, 298, 326; and thought, 316; reflex and voluntary, 300, 321; spontaneous, 332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